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AN INTRODUCTION

TO

GENERAL LOGIC

BY

E. E. CONSTANCE JONES

AUTHOR OF

'ELEMENTS OF LOGIC AS A SCIENCE OF PROPOSITIONS'

LONDON

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PREFACE.

My object in preparing this volume has been to provide a "First Logic Book" which may be used in teaching beginners, and at the same time furnish a connected, though brief, sketch of the science. I am aware that a large number of elementary Text-books and Manuals of Logic have appeared in recent years; and my only excuse for adding to the number is the hope I entertain that what I have to say may be of use, and may help to remove certain difficulties which are familiar to all teachers of Logic, and which have been very forcibly pressed upon my attention during an experience of several years, in teaching elementary Logic.

In the present volume I have attempted to set forth, as simply and systematically as possible, views indicated in a small book—substantially a collection of Notes on difficult points in Logic—which I wrote

three years ago. In that book I discussed fully the cases in which I diverge from traditional doctrines, and my reasons for the divergence; and this obviates, I hope, any necessity for introducing controversial matter in the present work—in which, of course, it would be peculiarly inappropriate. In the former book I acknowledged my obligations to various thinkers and writers, as far as I was definitely conscious of them; but in such matters it is perhaps never possible to trace more than a very small part of the debt which one owes to others.

My whole scheme, as here presented, follows naturally from the view taken of the twofold character of Terms—which, as Names of Things, have both application and signification. On this datum, together with the recognition that things have a plurality of Characteristics and a consequent plurality of Names, depends (I think) the possibility of Significant Assertion, and the whole doctrine of Inference, Mediate and Immediate. The Principle of Excluded Middle suggests and supports a recognition of the relatedness of things to one another; and a consideration of Bacon's doctrine of *Form* suggests a modification of Mill's view of Induction. The relation of Induction to Deduction appears to me to be so close that it is more convenient to regard all Logic as one, than to make a radical and fundamental division between Deductive (or 'Formal') and Inductive (or 'Material') Logic. Upon the twofold character of Terms, again, depends the explicit recognition of the Law of Identity as a Law of Identity in Diversity. And I believe that what I have to say about Relative Propositions in Section IV. and elsewhere, about Quantification in Section VII., the view of Disjunctives in Section VI., and of the force and interdependence of the Principles of Logic in Section XIX., is to some extent new; likewise the systematisation of Fallacies in Section XVIII., and—in part—the elaboration of Immediate Inferences in Section X. My view that Logic is concerned with Assertions expressed in language, and that it is distinctly not a department of Psychology, is not peculiar to me.

I have omitted from the text any matters of which the interest is largely historical, or which are not of direct importance for the theoretical outline which is all that I have attempted to give. But for convenience of reference, a brief account of such of these as are generally included in elementary text-books is

contained either in the Notes which follow Section XIX., or in the Index and Vocabulary.

A collection of Questions precedes the Index. They are taken chiefly from published Examination Papers of the University of Cambridge, and a few are from Oxford or London Examination Papers. A considerable number, however, are extracted from published works of the late Professor Jevons. These are marked with a (J); and those from Cambridge, Oxford, or London papers with (C), (O), or (L) respectively. The Table of Contents is intended to furnish a complete summary of the text.

I wish to express my sincere thanks to Professor Caldecott, M.A., of King's College, London, and of St. John's College, Cambridge, for his kindness in reading the proofs of this book, and for much valuable criticism. I am also indebted for several suggestions to Miss Alice Gardner and Miss E. Rhodes, both of Newnham College, Cambridge.

GIRTON COLLEGE, CAMBRIDGE,
March 24th, 1892.

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All knowledge is contained in Statements or Propositions. The only method of explaining, questioning, justifying, or disproving any Proposition is by means of other Propositions having some relation to it. Logic may be called the Science of the Import and Relations of Propositions; and since all Sciences are expressed in Propositions, Logic is thus the Science of Sciences—that is, the Science of a method of procedure which applies in every department of knowledge. General Logic starts from the standpoint of ordinary thought, and assumes Reason in Man and Trustworthiness in Language, ... 1-3

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A Proposition is an assertion expressed in words, and Propositions may be primarily divided into Categorical, Conditional, Hypothetical, and Alternative. A Categorical Proposition consists of two Terms (Subject and Predicate) and a Copula. Terms are primarily Names, and a Name is a word or combination of words applying to some thing or group of things, and signifying some characteristics of that to which it applies. Appli-

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cation and Signification of names correspond to Existence and Character in the things named. Names may be divided into (1) Substantive Names, (2) Attribute Names, (3) Adjectival Names: (1) being further divided into Common, Special, Proper, and Unique. (1) and (2) may be either Subjects or Predicates of Propositions, but Adjectives can be Predicates only, and can be predicated of either (1) or (2), whereas (1) and (2) cannot be predicated of each other. Proper Names afford in themselves no guidance whatever for their own application in fresh cases. A Term is any word or combination of words applying to that of which something is asserted (Subject), or to that which is asserted of it (Predicate). *Term* must be distinguished from *Term-name.* Many of the most important distinctions in Propositions depend upon differences in the Terms, especially in the Subject-Terms. Still the characteristics of Terms often cannot be settled without reference to the Propositions of which they are Terms. The widest distinction between Terms is that between Uni-terminal or Adjectival Terms (Terms which can only be used as Predicates of Propositions); and Bi-terminal Terms (Terms which may be used both as Subjects and Predicates). To this distinction there corresponds a division of Propositions into Coincidental and Adjectival. The principal division of Bi-terminal Terms is into Attribute Terms and Substantive Terms. Among the further subdivisions of Terms, a specially important one is that into Absolute and Relative (implying a dependence or relation of Subjects of Attributes connected in some system, which may be of any degree of complexity, from the simplicity of a class or of any two related objects to the intricacy of a genealogical tree, or even of the Universe itself). From a Relative Proposition—*i.e.* a Proposition containing a Relative Term (*e.g.* E is *equal to F*),—far more immediate inferences can be drawn than can be drawn from an Absolute Proposition. Mathematical Propositions are a specially important case of Relative Propositions. The Copula may be affirmative or negative. Its office is to express a certain relation between the Terms, ... 4-17

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An Inferential Proposition is a Proposition of the form, *If A, then C*; and expresses a relation between Antecedent and Consequent such that an identity (or identities) expressed or indicated by the Consequent is an inference from an identity (or identities) expressed or indicated by the Antecedent. Inferential Propositions may be (1) Hypothetical or (2) Conditional. A Hypothetical Proposition is one in which two (expressed or indicated) Categoricals (or combinations of Categoricals) are put together in such a way as to express that one (Consequent) is an inference from the other (Antecedent). A Conditional Proposition is one which asserts that any object which is indicated by a given class-name and distinguished in some particular way, may be inferred to have also some further distinction. The import of an Inferential may be expressed in a Categorical of the form, *C is an inference from A*. Hypotheticals are either Self-contained or Referential, Conditionals are either Divisional or Quasi-Divisional, ... 42-50

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but there must be some exclusiveness of Signification. An Alternative Proposition may be defined as a Proposition in which a plurality of differing elements (connected by *or* and called the Alternatives) are so related that *not all* of them can be denied, because the denial of some justifies the assertion of the rest. Alternative Propositions may be Conditional, Formal, Subsumptional, or Contingent, ... 52-56

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Syllogism; by *Figure* is meant the order of Terms in the Premisses of a Syllogism. There are four Figures of Syllogism, called respectively the 1st, 2nd, 3rd, and 4th Figures; and nineteen valid Moods (not counting the Moods in which there is a weakened Conclusion). The First Figure has been regarded as the most perfect, because to it, and to it alone, the Aristotelian Canon of Syllogism (the so-called *Dictum de omni et nullo*) applies directly. Hence arose the doctrine of Reduction—that is, of the transformation of Figures 2, 3, and 4 to Figure 1. Full directions for Reduction are infolded in the ancient mnemonic verse '*Barbara, Celarent*,' etc.—Relative Categorical Arguments are Arguments of which the Premisses are Relative Propositions—they do not, like Syllogisms, conform to one strict and invariable pattern, and the Canon and Rules of Syllogism will not apply directly to them—but their cogency (to any one who understands the relations of the System they refer to) is just as evident as that of Syllogistic or Absolute Argument; and it is possible to express them in Syllogistic form. It does not seem possible to frame a more precise Canon of Relative Categorical Mediate Inferences than the following:—If two objects, A and B, are related to each other, and B is related to a third object, C; then A is related to C in accordance with the laws of the system to which A and B and C belong, ... 114-132

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Inductive Inferences are Mediate, and they differ from Deductions in this, that they consist of one Universal and one Particular Premiss, and a Universal Conclusion. In an Induction we arrive, by the help of facts or particulars, at some fresh generalisation or law. All Inductions are based upon the Principle that every phenomenon is inseparable from *some* other phenomena, and that there is uniformity of interdependence between phenomena.

Since Interdependents may be related either as Concomitants or as Cause and Effect, the Principle of Interdependence may be amplified as follows :—Every characteristic of an object has some Concomitants, and every change or event has some Cause and some Effect ; moreover, not only is there this connection in any given case, but the connection is uniform—that is, not only must every characteristic have *some* Concomitants, and not only must every event have *some* Cause and *some* Effect, but phenomena that are once connected as Concomitants, or as Cause and Effect, are always so connected. And Uniformity of Causation must depend upon Uniformity of Concomitance—our power of predicting that one event, A, will be followed by another event, B, must depend wholly upon co-existence of characteristics in the Subjects concerned—*event* meaning *change in Subjects of Attributes*. And it seems further that not only is every characteristic invariably accompanied by a certain other characteristic, as Bacon surmised, but also that every kind of characteristic is one of an unique group with which it is invariably and inseparably connected. The form of the Principle of Interdependence by which we are guided in practice is the maxim that If anything, X, is like another thing, Y, in one respect, it is like it in a plurality of respects. But in order to apply the maxim so as to arrive at an Induction in any given case, we need not only to know that similar phenomena have similar accompaniments, but also to know *what*, in that case, those accompaniments are. It is at this point that the 'Inductive Methods' help us. The result of an application of any of those Methods is the establishment of an interdependence between given phenomena in some case or cases. The assumptions upon which reliance is placed in reasoning by the Inductive Methods may be summed up as follows :—If A has never been found without B [nor B without A]—(*Method of Agreement* [*in Presence and Absence*]) ;—or if the introduction of A is followed by the appearance of B, or the removal of A by the disappearance of B (*Method of Difference*) ; or if variation of the quantity of A is accompanied or followed by variation in the quantity of B (*Method of Concomitant Variations*) ; or if in any clearly marked-off set of attributes or events AC—BE, C and E are interdependent (*Method of Residues*)—then A and B are interdependent.—In an Inductive Argument by Analogy, the interdependence that we rely upon is inferred from the complexity or amount of interdependence already known or supposed. The reason why we never use, nor need to use, the Inductive Methods in the case of Mathematical Inductions, is that in these cases the inseparability of characteristics is a matter of direct perception : to this reason is due also the peculiar certainty which is attributed to Mathematical Generalisations. The Principle of Interdependence involves the axioms that (1) No two things are alike in one respect only, and (2) No thing is unlike another thing in one respect only, nor can any thing change in one respect only. To this we may add that, (3) No two things are alike in all respects ; (4) No two things are unlike in all respects. (1) and (2) may be summed up for practical guidance in the maxim, *Apparent* likeness, unlikeness, or alteration is accompanied by *non-apparent* likeness, unlikeness, or alteration.—Induction requires perception or recognition of the Universal in the Particular. In this there are three aspects or stages :—(1) Hypothesis ; (2) Justification of Hypothesis (generally equivalent to proof of Interdependence) ; (3) Extension from the known case(s) to unknown cases—a recognition that the particular interdependence involves a connection holding universally. The assumptions which seem indispensable to Induction may be justified by the consideration that they *are* indispensable—that they are involved in the inductions which we are continually making, and on which we unhesitatingly depend. If we accept the Inductions, we must in consistency accept the principles which they involve. And if we do not accept the Inductions, we are entangled in a web of hopeless inconsistencies. Further, in Section xix. we shall see how nearly the Principle of Induction is on the same footing as the Principle of Significant Categorical Assertion, ... 133-149

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An Inferential Mediate Inference (or Argument) consists of Inferential, or of Inferential and Categorical Propositions. A Pure Inferential Argument (1) consists of three Inferential Propositions; a Mixed Inferential Argument (2) has an Inferential Major Premiss and a Categorical Minor and Conclusion. (1) may be Hypothetical (*a*), or Conditional (*b*); (2) may be Hypothetico-Categorical (*c*), or Conditio-Categorical (*d*). There are separate Canons for (*a*), (*b*), (*c*), and (*d*), . . 150-151

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As regards Method generally, it may be laid down that, in any case, the end in view should not be lost sight of: that tautology, obscurity, inconsistency, and irrelevancy should be avoided; that the relations of the parts of a subject should be plainly set forth; and that the propositions which are accepted as fundamental should be

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themselves either self-evident or inferences from other propositions which are self-evident. There are other conditions of a satisfactory choice and articulation of material, but they are not easily reducible to rule. *Classification* should be distinguished from *Classing*, which has a close connection with Definition. Classing consists in grouping together a number of numerically distinct *objects* in virtue of their possession of similar characteristics, these characteristics being those which are unfolded in the Definition of the Class-name. In Classification we are concerned with the relations of a number of *classes*, the objects composing those classes being regarded as members of a system of individuals. The function of a Classification or Systematisation is to bring out the Unity in Difference which belongs to any group of related things—Classification and Division are the same thing looked at from different points of view. A Division starts with unity and differentiates it; a Classification starts with multiplicity and reduces it to order. A good Division or Classification should be appropriate to the purpose in hand; co-ordinate classes should never overlap; and at every stage of a Division or Classification the co-ordinate classes should be identical in extension with the co-ordinate classes of every other stage, and with the *Summum Genus*. From *Classing* and *Classification* we may distinguish *Systematisation*—the arrangement of the differing parts of a whole (whether single objects or groups of objects) in their relations to each other and to the whole. A Systematisation may often include Classifications, ... 157-162

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By the Definition of any word is meant a Statement of the Meaning or Signification of the word—that is, a Statement of *the characteristics on account of which we apply the name, and in the absence of any of which we should not apply it*. Every name is capable of being defined if we include the characteristic of *being called by the name* among those characteristics of a thing which are comprised in the

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Signification of its name. But a Definition of the kind of Term which is called a Proper Name is not valuable, since in this case Definition can never suffice as a guide to the *first* reference of a name to its object, nor can knowledge of the reference of a given name in one instance ever be a guide to its reference in any other instance. A Definition should be expressed in language that is clear, simple, not tautologous, and also (if possible) affirmative; the word defined and the Definition of it must have identical application, and the Definition must state the characteristics included in the Signification and those only. The most important Definitions are those of Class-Names, and Classing has a close connection with Definition, since Classing consists in grouping together a number of *numerically distinct* objects in virtue of their possessing *similar characteristics*, while those characteristics constitute the Signification, and this is unfolded in the Definition. And both Classing and Definition are connected with Induction, for Class-Names may be regarded as a result of Induction, and every fresh Induction that is summed up in the Signification of a Class-Name may be expressed in the Definition of the name. But the ultimate and supreme difficulty in Definition is to determine Signification. The difficulty arises from the fact that all objects have a vast multiplicity of properties (among which are to be reckoned likenesses and unlikenesses to other things); and since no Definition could state *all* the characteristics possessed in common by any collection of objects, a choice must be made from among many possible groups of characteristics. This choice ought to be primarily determined by its appropriateness to the purpose in hand; it ought also to be as far as possible conformable to usage, and at the same time consistent; and, finally, the characteristics selected ought to be impressive and distinctive. The force of any word as used in Assertion depends largely upon context, including the unique context which may accompany it in an individual mind. But the idea corresponding to any word must be in *some* respects similar in the minds of all those who understand its Application and Signification, ... 163-177

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Confusion should be regarded not as itself Fallacy, but as a *source* of Fallacy. All Fallacy consists (1) in identifying what is different, or (2) in differencing what is identical; thus we get a primary subdivision of Fallacies into those of (1) professed Identification, or Discontinuity; (2) professed Difference, or Tautology. Under these heads Fallacies of Definition, Division, and Classification may be brought quite naturally. Fallacy may be defined as the assertion or assumption of some relation between (i.) Terms, or (ii.) Propositions, which does not hold between them. Or, taking the word in a narrower sense, there is Fallacy whenever we conclude from one or more Propositions to another, the conclusion not being justified by the premiss or premisses. The so-called Semi-logical and Material Fallacies are reducible to Formal Fallacies — Elemental, or Eductive, or Syllogistic, or Circular. Besides Formal Fallacies, there are also Fallacies which can only occur with Relative Propositions, ... 178-199

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The foundations of Logic are the Principles which are involved in making Assertions and in putting them together. The primary form of Proposition is the Categorical; hence we need in the first place a Principle of Categorical Assertion. We find such a Principle in the Axiom of Identity in Diversity, which may be formulated thus :— Every thing which can be thought of or named is an Identity in Diversity. This law may be represented by the symbolical statement *A is B*; *A* signifying any name whatever, and *B* signifying any *other* name which has

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the same application as *A*. The Law of Identity in Diversity may not (any more than the Principle of Interdependence) be generally admitted as *prima facie* self-evident; but its acceptance is a necessary condition of the acceptance of propositions which are at first sight and unquestionably self-evident—*e.g.* Mathematical axioms and the Law of Contradiction. And the Principle of Interdependence is involved (in part) in the Law of Identity, and in self-evident mathematical axioms. And it appears moreover to be involved in the Law of Contradiction, so far at least as the interdependence of *the presence of B* and *the absence of not-B* is concerned. And so far, too, the Principle of Interdependence appears to be directly self-evident; while, on reflection, the Principle of Identity in Diversity seems to exhibit this same characteristic of self-evidence. According to the Law of Contradiction a proposition and its negative cannot both be affirmed—If A is B, A is not not-B; and according to the Law of Excluded Middle a proposition and its formal alternative cannot both be denied—Either A is B, or A is not B. These laws are complementary to each other, and are both strictly self-evident.—The Law of Identity in Diversity may be regarded as the Principle of the possibility of Significant Assertion, the Law of Contradiction as the Principle of Consistency, and the Law of Excluded Middle as a Principle of Completion. With these Principles must be co-ordinated that of Interdependence with its two branches, the Law of Concomitance of characteristics, and the Law of Causation of Events. We ought further to include here a statement which sums up roughly the assumption on which the Inductive Methods are based, namely, the rule that phenomena which are never found separate from each other (being co-existent, or successive, or co-variant) are Interdependent. For Relative Inferences, two Principles of Inter-relation are needed—(1) that all Relations are reciprocal, (2) that any objects that are related indirectly are also related directly. The corner-stone of Logic is the Principle that what is Self-evident ought to be believed.—The fundamental Category of Logic is Unity in Difference, . . . 202-211

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ERRATA.

Page 14, line 14, *for* $(a \times b)^2$ *read* $(a+b)^2$.
,, 219, ,, 12 from foot, *for* Syllogisms *read* Propositions.

PART I.

IMPORT OF PROPOSITIONS.

SECTION I.

DEFINITION AND SCOPE OF LOGIC.

ALL knowledge that is communicated and recorded is contained in Statements or Propositions; and a Statement or Proposition is an Assertion expressed in words. Now, we believe certain statements and disbelieve others, and, as reasonable creatures, we must be prepared to give some justification, alike for our Belief and for our Disbelief. If we believe any statement, we can only justify our belief by bringing forward other statements; if we disbelieve any statement, the only method open to us of justifying our disbelief is, again, by bringing forward other statements. Any statement or proposition that is called in question may be shown to be compatible or incompatible with, or an inference from, the propositions which we bring forward. For instance, I believe the statement that hydrocyanic acid, in certain quantities, is a swift and powerful poison. And if called on to justify

my belief, I might adduce the propositions (1) that hydrocyanic acid has been known to cause sudden and violent death, (2) that Nature is uniform.

Again, I do not believe the statement that the Sun goes round the Earth. And I justify my disbelief by the considerations (1) that this hypothesis does not explain the motions of the heavenly bodies, and (2) that no hypothesis ought to be accepted which does not explain the phenomena to which it is applied.

Again, I believe the statements that (1) Philosophers are fallible, and that (2) If equals be added to equals, the wholes are equal—(1) because all men are fallible, and philosophers are men; (2) because it is self-evident, and what is self-evident ought to be believed (*cf.* Section xvi.).

And in every other case, in order to establish, or to demonstrate the falsity of, any propositions which are questionable or questioned, we need to test them by considering their relation to other propositions. Further, it is plain that, in order either to question or to explain any propositions, we must make use of other propositions which have some bearing upon them—that is, some relation to them. The business of Logic is to show what is the Import or Meaning of Propositions, and what are the Relations between Propositions; and it is evident that an inquiry into the Import or Meaning of Propositions is a necessary preliminary to an inquiry into the Relations of Propositions. Thus, since all Knowledge is expressed in

Propositions, and Science is systematised Knowledge, it follows that Logic applies to *all* Sciences—to Psychology as well as to the Natural Sciences, to Mathematics as well as to Grammar, to Philosophy as well as to Insurance and Statistics. Hence Logic, as the 'Science of Propositions,' is emphatically the 'Science of Sciences'—the Science of a Method of procedure which applies in every department of Knowledge.

If Logic is the Science of Propositions, it will naturally start from the standpoint of ordinary thought, ascertained by reflection on such thought, as expressed in ordinary language. Two assumptions which appear to be involved in ordinary thought are, that (1) the application of terms is uniform, and (2) that which is self-evident ought to be believed. That is to say, ordinary thought assumes reason in man, and trustworthiness in language. The first assumption may, in any given case, turn out to be unwarranted; but in order to prove that it is so in that particular case, in order even to doubt or to examine that case, we are bound to assume it to some extent. And what *appears* to be self-evident may sometimes turn out not to be so; but we can only test any given case by further appeals to what appears to be self-evident. Hence it seems that, as an indispensable condition of intelligent scepticism in any particular instance, we must assume—at least, provisionally—the general trustworthiness of language and of human intelligence.

SECTION II.

ELEMENTS OF CATEGORICAL PROPOSITIONS.

A PROPOSITION may be defined as—

An assertion expressed in words.

Propositions may be primarily divided into (1) Categorical—*e.g.* All white violets are fragrant, Honesty is the best policy; (2) Conditional—*e.g.* If any violet is white, it is fragrant; (3) Hypothetical—*e.g.* If ancient astronomers were right, the sun goes round the earth; (4) Alternative or Disjunctive—*e.g.* Any goose is grey or white, Any violet is fragrant or not-white, The sun goes round the earth, or ancient astronomers were wrong. (2) and (3) may be classed together as Inferential.

Proposition

Categorical | Inferential | Alternative

Inferential: Conditional | Hypothetical

In investigating the import of Propositions we have to consider (1) the constituent elements of propositions, (2) the force of propositions as wholes. Any

Categorical Proposition consists of Terms and Copula. For instance, in the categorical proposition, *Life is sweet*, *Life* and *sweet* are Terms, and *is* is the Copula. And *Life* and *sweet* are not only Terms, they are also Names: as they occur in the columns of the dictionary, for instance, they are names merely.

A NAME may be defined as—

A word (or combination of words) *applying* to some thing or group of things, and *signifying* some characteristics of that to which it applies.

Every name is capable of being used as a term, either alone or joined with some modifying word: as All, This, Some, Most, Many. A name must of course apply to *something* (of which it is the name), otherwise it is not the name of anything; and it must indicate *some characteristics* of that something, otherwise there would be no reason for applying it to anything in particular. (The name of anything is inevitably one of the characteristics indicated by the name; and for us who know the thing by its name, and must refer to it by its name, this characteristic is highly important.) This double office of every name —*i.e.* (1) its applying to something, and (2) its implying *some characteristics* of that something—corresponds to the *Existence* and *Character* of the things which names refer to. In order to be *something*, to be *anything at all*, a thing must *exist* (somehow);

and whatever exists at all, must exist *somehow*, must have some characteristics by which it is distinguished from other things. Take the names (1) Tree, (2) Ghost, (3) Greenness, (4) Intangibility—each of them is the name of something which has enough existence to be *something*—(1) and (2) of things which are themselves Subjects of Attributes; (3) and (4) of things which are themselves Attributes of Subjects. And (1) and (2) imply Characteristics by which *Trees* and *Ghosts* are distinguished from other Subjects of Attributes, from Ferns, Solid Bodies, etc.; while (3) and (4) imply Characteristics by which *Greenness* and *Intangibility* are distinguished from other Attributes —from Whiteness, Hardness, Triangularity, etc.

We may say that that in the name of anything which corresponds to the *Existence* of the thing named, is the *Application* of the name; and that that which corresponds to the *Character* of the thing is the *Signification* of the name. As far as Application goes, all names are on the same level—the Application of a name means simply that it *applies to* something—that in fact it is *the name of* something. But in respect of Signification, names differ very widely. *E.g.* what are called Proper Names differ from all other names in this, that they imply *no* distinctive common characteristic in the objects to which they apply, other than that of being called by the name. (This distinctive characteristic may be highly important—*e.g.* for purposes of reference.)

Hence—as the characteristic of having the name can be no guide to the application of the name (for, as Jevons says, 'John Smith does not bear his name written on his brow')—Proper Names have the unique distinction of affording in themselves absolutely no guidance to their own application, in the case of any fresh object. When I have seen and known three or four Lions or Triangles, I can apply the name without further information in the case of any fresh Lions or Triangles that I may meet with; but if I have seen and known three or four John Smiths, that does not help me in the least to recognise the next John Smith that I meet with. Of all the objects called by the name John Smith we can only predicate (1) what is common to all Subjects, (2) unique individuality, (3) a distinctive name, (4) what the name is—that is to say, John Smith. Of such names as Lion, Triangle, Clumber Spaniel, Armadillo, Fourpenny-bit, Triangularity, Generosity, Red, Blue, Hexagonal, we can—without any other knowledge than the names afford—predicate a number of characteristics distinctive of the Class or Attribute denominated; and it is on this account that (at any rate when we have once learnt the application of such names) we are able to recognise the objects to which they apply in fresh cases. We may of course have a combination of names of this kind with Proper Names—*e.g.* Madingley violets, London fogs, Alexander's father, Cæsar's wife; and there are certain individual names which

are as fully significant as Class Names—*e.g.* The largest Continent.

Between such names as Fog, Whiteness, Violet, Fragrant, and such names as Sydney, Maria, Colney, Richmal, there come such names as Saturday, December, Winter, Czar, Archbishop of Canterbury, where application is limited by some constant condition not implied in the Signification. For instance, Winter *means* the coldest season of the year, Saturday *means* the last day of the week—but we could not say that it is part of the meaning (or Signification) of Winter that in temperate zones it only occurs at intervals of nine months, or of Saturday that it comes fifty-two times in the year. Whatever day has the characteristic of being the last day in the week is a Saturday, whatever season has the characteristic of being the coldest season in the year is Winter; but the application of the names is further restricted by the circumstance that periods having these characteristics can only occur at certain intervals, and this circumstance is not included in the definitions of *Saturday* and *Winter*.

Again it would not be included in the Signification of Czar or Archbishop of Canterbury that there can be *only one at a time*, but the application of the titles is limited by this condition.

We have mentioned that a Categorical Proposition may be analysed into two Terms and the Copula—*e.g.* in *Life is sweet*, *life* and *sweet* are terms, and *is* is the

Copula. Further, the two Terms are called respectively Subject and Predicate. *E.g.* in the Proposition just given, *life* is Subject, and *sweet* is Predicate. The Subject indicates that which is spoken about, the Predicate expresses what is affirmed or denied about that which is indicated by the Subject, the Copula determines the relation between Subject and Predicate. If we put *S* in the place of *life*, and *P* in the place of *sweet*, we get the form *S is P*, which may be taken as a symbolical representation of any affirmative Categorical Proposition.

Term may be defined as—

> Any word, or combination of words, applying to that of which something is asserted (S), or to that which is asserted of it (P).

A Term (whether S or P) may consist of only one word, as in (1) Snow is white, (2) Perseverance is admirable; or of several—as in (3) The Marquis of Salisbury /is/ the present Prime Minister of England, (4) All men /are/ liable to err. In (1) the S applies to an unorganised material substance, in (2) to an Attribute, in (3) to a Definite Individual, in (4) to a whole Class. In (1) and (2) the P contains only one word, in (3) it contains six words, in (4) it contains three words; but in all these cases the office of P is precisely the same—namely, to give some information about the thing or things indicated by S. What is indicated by S may be either a Subject of Attributes or an Attribute of some Subject.

When a name is used alone as S or P of a proposition, then *Term-name* and *Term* coincide—*e.g.* in Arsenic is poison, Truth is strong, Fritz is Emperor, Term-name and Term are in every case coincident. In Some mistakes are irremediable, we can distinguish in the Subject of the proposition two elements—that is, the class-name Mistakes, and the adjective of quantity Some, and these two elements together make up the Term (S). In This man is a genius, we may regard S and P as each consisting of two elements—viz. class-name (Man, Genius) and adjective of quantity (This, A). Man, Genius, may be called Term-names; This, A, may be called Term-indicators. The value of this distinction between *Term* and *Term-name* will be apparent when we come to consider the Import of Propositions.

There are certain important characteristics of names which help us to make a broad and simple Classification of Names, that may precede and direct their use *as terms*. For while some names may be used as terms (or term-names) for both S and P of a proposition, there are other names which can be used as P only. For instance, we can say *Trees* are organised, Oaks are *Trees*, *Men* are fallible, Negroes are *Men*, All *Birds* are feathered, All Thrushes are *Birds*—and so on. But we cannot say, *e.g.*, *Strong* are steady, *Blue* is brittle. We should be asked, Strong *what?* Blue *what?* But if we say, Some men are *strong*, The Lake of Geneva is *blue*, no one feels it necessary to

ask, *What* is strong? or *What* is blue? because it is clear that those adjectives refer to the substantives that precede them. These considerations suggest that the prominent element in the names called Adjectives (names which are *adjected* to others) is their Signification (*i.e.* the characteristics which they imply), rather than their Application; and this conclusion is corroborated by the fact that in English, adjectives are not inflected when they qualify plural substantives. In German, also, adjectives which occur as Predicates of Propositions are not inflected to agree with their Subjects—*e.g.* Der Himmel ist blau, Das Buch ist interessant, Die Rosen sind weiss. And we may predicate adjectives either of Subjects of Attributes, or of Attributes—*e.g.* A just man is *admirable*, Perseverance is *admirable*—while a name denoting a Subject of Attributes cannot be predicated of an Attribute, nor can a name applying to an Attribute be predicated of a Subject of Attributes. Indeed, where the S of a proposition is an Attribute name, there are very few instances in which anything but an adjective (or adjective-phrase) can be predicated. If we except such cases as Courage is a Virtue, Redness is a Colour, and cases in which the Predicate is a synonym of the Subject—*e.g.* Courage is Valour—we shall find that most propositions which have an Attribute-name for S have an adjective or adjective-phrase for P. *E.g.* Beauty is attractive, Good-temper is delightful, Secretiveness is repulsive, Heroism is

uncommon. On the other hand, propositions which have Substantive Names for S may always have Substantive Names for P.

Hence it appears that we may make a primary division of Names into Attribute Names (*e.g.* Whiteness, Strength), Adjective Names (*e.g.* White, Strong), and Substantive Names (*e.g.* Man, Fairy, Peter, Saturday, Longshanks). And in accordance with the distinctions previously taken (*cf.* pp. 6-8) Substantive Names may be divided into Common Names (*e.g.* Bee, Oak-tree, Saucer, Fairy, Cause), Special Names (such as Saturday, Marquis of Worcester, One o'clock), Unique Names (*e.g.* The longest river in the world), and Proper Names (such as Rose, Benbow, Newton, Swift, Patience, Strong, Grace, Longchild). These different kinds of names, as above remarked, may be variously compounded.

Although many important distinctions in propositions depend upon differences in their Terms, especially the Subject Terms (*e.g.* any proposition beginning with a class-name qualified by *All* or *No*, is Universal, one beginning with a class-name qualified by *Some* is Particular), yet the character of Terms can never be satisfactorily settled until we have considered what their place and special force are in the propositions to which they belong. An isolated name can mostly be classed on mere inspection as primarily adjectival or substantival, and so on; but the terms of any proposition must be regarded *as parts* of that pro-

position, and only when so regarded can they have their character definitely and fully determined—this character, of course, depending on the character of the thing named. For instance, if I am asked to describe the name *Whiteness*, I have no hesitation in calling it an Attribute Name; but if the word *Whiteness* is given to me as a *term* or *part of a term*, and I am required to describe it, I can only say, Until I know the proposition in which it occurs, I am unable to do so. If, *e.g.*, the proposition is, Whiteness is a colour, then *Whiteness* is an Attribute Term; if the proposition is, This table-cloth is whiteness itself, then I should say that *Whiteness* is part of an Adjectival Term (*whiteness itself* being equivalent to *as white as white can be*); if the proposition is, This whiteness is death-like, I should say that *Whiteness* is part of an Attribute Term, *This whiteness* (*this whiteness* meaning *this pallor of countenance*—for an exactly similar colour on china or on silk, etc., need not be death-like).

Terms may be divided primarily into two classes (1) Uni-terminal, and (2) Bi-terminal Terms. (1) are terms which can only be used as P of Categorical Propositions; (2) are terms which may be used as either S or P of Categorical Propositions.

All Uni-terminal Terms are Adjectival, and the only important subdivision of them is into Relative (implying a relation or dependence of objects connected in some system, which may be of any degree

of complexity, from the simplicity of a class, or of any two related objects, to the intricacy of a genealogical tree) and Absolute (which do not imply such relation or dependence). Any one who has an acquaintance with the 'system' referred to by a Relative Term can draw from a proposition containing it a greater variety of inferences than is possible in the case of propositions which contain only Absolute Terms (compare *E is F*—Absolute Proposition—and *E is equal to F*—Relative Proposition); hence the logical importance of this distinction. Mathematical Propositions generally contain Relative Terms. *E.g.*

$2+2=4$ ($2+2$ /is/ equal to 4):
$(a\times b)^2=a^2+2ab+b^2$;
The two sides BA, AC /are/ equal to the two sides DA, AC;
A /is/ greater than B;
6s. 8d. /is/ one-third of £1.

A fortiori arguments are simply a special case of arguments which turn upon Relativity of Terms. All kinds of terms are divisible into Relative and Absolute. Relative Adjectivals are such as, Like B, Before C, Equal to D, Less pinnatifid than E, Out-Heroding Herod; Absolute Adjectivals are such as, Blue, Strong, etc.

To the division into Uni-terminal and Bi-terminal Terms there corresponds a division of Propositions into what may be called (1) Adjectival, and (2) Coincidental Propositions. (1) are Categorical Propositions

which have a Uni-terminal Term for P, and can neither be converted nor (*cf.* p. 58) quantificated—(*e.g.* from All Bushmen are short, I cannot proceed to say All Bushmen are some short, nor Some short are Bushmen); (2) are Categorical Propositions which have Bi-terminal Terms for both S and P. As a rule these can be quantificated and converted. (*E.g.* from All Bushmen are savages, I can go on to say, All Bushmen are some savages, and Some savages are Bushmen.) For obvious reasons such propositions as, Rashness is not courage, Justice is fairness, Tully is Cicero, cannot have either S or P quantified. And propositions of the form Some R is not Q, are not considered to be susceptible of conversion. The distinction here taken will be further noticed in connection with Conversion; and when we come to consider Syllogism, it may be seen that no Syllogism can consist entirely of Adjectival Propositions.

The principal division of Bi-terminal Terms is into (1) Attribute Terms (having an Attribute Name for Term-name), and (2) Substantive Terms (having a Substantive Name for Term-name). The Substantive Terms are Common, Special, Unique, or Proper, having respectively a Common, Special, Unique, or Proper Name for Term-name. (Term and Term-name, as before observed, are sometimes coincident, as in, Byzantium is Constantinople.)

(1) and (2), again, may be divided into (*a*) Whole and (*b*) Partial Terms: *e.g.* (1) and (2) (*a*), Steadfast-

ness, Stupidity, All men, The days of the week, Homer; (1) and (2) (*b*) His courage, Some cruelty, One pilgrim, Several lapwings, Two months in the year, One of the Jewish patriarchs. Terms may also be Definite (as, Rembrandt, All artists, This mathematician, That generosity), or Indefinite (as, Some injustice, Most poets, A robin); and finally they may be Relative (as, King of Greece, Wife of Zeus, Loaf of bread, Equality of angles, Congestion of the lungs, Death by famine, Day of the week), or Absolute (as, Truth, Fear, Lion, April, Isaac Newton).

It may be noticed that many Technical and other Terms which have the form have not the force of Relative Terms—*e.g.* Fibres of Corti, Will of iron, Man-of-war.

I think that the reason why such names as *Gold*, *Water*, The number *six*, The *half-sovereign*, The word *and*, The word *symbol*, and so on, are always or mostly used in the singular number, is because these names apply to things of which the intrinsic character and value do not vary from instance to instance. Compare the corresponding plural use of such names as peas, beans, etc. Attribute Names only take a plural in a few cases—*e.g.* colour, virtue, quality, but the application of Attribute Terms may be limited by the term-indicator—*e.g.* Much cruelty is unthinking.

The only other constituent of a Categorical Proposition besides the Terms, is the Copula. This may be

Affirmative—*is*, *are*: or Negative—*is not*, *are not*. The office of the Copula is to express a certain relation between the Terms. The statement of this relation involves a statement of the Import of Propositions as wholes, and to the consideration of this we proceed in the following Section.

TABLE I.

NAMES.

- *Adjectives.* *E.g.* Blue; strong; Chartist; red as fire; true as steel.
- *Attribute Names.* *E.g.* Strength; Blueness; Chartism; Embolism of an artery; Devotion to a good cause.
- *Substantive Names.*
  - *Common Names.* *E.g.* Man; fairy; crew; gold; year; mile; Daniel come to judgment; Cantab; dandelion; *pinna* of a Polypodium; 'William Allen Richardson' (a rose); 'Ragged Robin'; H_2S.
  - *Special Names.* *E.g.* The days of the week; Sunday, Monday, . . . Saturday; 1 o'clock, 2 o'clock, . . . 12 o'clock; the conic sections; genus; species; April; Friday; King of Spain.
  - *Unique Names.* *E.g.* The sun; 1888 A.D.; the greatest poet; the last of the Mohicans; the Apostles; the elements.
  - *Proper Names.* *E.g.* America; Vancouver's Island; Tisiphone; John Pearce; Mary; 'Longshanks.'

TABLE II.

TERMS.

Uni-terminal Terms. (Attributive or Adjectival Terms.) | *Bi-terminal Terms.*

Attribute Terms. | *Substantive Terms.*

Common T. | *Special T.* | *Unique T.* | *Proper T.*

Whole Terms. | *Partial Terms.*

Definite Terms. | *Indefinite Terms.*

Relative Terms. | *Absolute Terms.*

SECTION III.

CATEGORICAL PROPOSITIONS AS WHOLES.

A Categorical Proposition may be defined as—

> A Proposition which asserts Identity (or Otherness) of Application in Diversity of Signification—(Application in Terms, as already pointed out, corresponding to Existence in Things, Signification in Terms corresponding to Character in Things).

In the Proposition, Snow is white, the Application of *snow* and *white* is the same—the object which I refer to, and call *snow*, is the very same object that I refer to and call *white*: *white* is what the snow is—the application of P is limited by the application of S. But the Signification of *snow* and *white* is different—the two words signify different characteristics or qualities, and would be differently defined. In, Bounce is my brother's dog, *Bounce* and *my brother's dog* refer to the same identical quadruped, but the two words have not the same signification. In, That tree is an oak, *That tree* and *an oak* refer to one

single identical object—but the signification of the one Term is diverse from that of the other.

Similarly in

> The sky is cloudy,
> Patience is sometimes necessary,
> *Fanciullo* is the Italian for *child*,
> My head is aching—

in each proposition the S and the P have an identical reference—they apply to the very same object; and in each proposition the significations of S and P are diverse—in each case the characteristics implied by P differ from the characteristics implied by S.

Again in

> All lions are quadrupeds,

All lions and *quadrupeds* refer to *the same objects*: the *quadrupeds* which I assert that lions are, are just the quadrupeds which *are lions*, and no others. All other quadrupeds—*e.g.* tigers, oxen, jackals—are *not* lions. The quadrupeds referred to by the P are just *as many* quadrupeds as there are lions, and just *the very same* quadrupeds as the lions. But *all lions* and *quadrupeds* are differently defined, signify different characteristics.

Or if I say—

> Some birds' eggs are speckled,

Some birds' eggs and *speckled*, while differing in signification, refer to the same objects—the *speckled* which I assert of *some birds' eggs* has no wider application

than just to those very birds' eggs of which I am speaking. To say that it has, that it refers, *e.g.*, to *all speckled things*, would be to leave out of account the limitation of the application which the term *speckled* has because of its position in the proposition. And further, if *all speckled things* were the Predicate to *some birds' eggs*, the Copula would have to be, not *are*, but *are not*.

Again, if in speaking of three of Rembrandt's pictures—the 'Night Watch,' the 'Syndics,' and the 'Portrait of his Mother'—I say

These pictures are some of Rembrandt's masterpieces,

the objects referred to by *these pictures* and by *some of Rembrandt's masterpieces* are identically the same—namely, the three which I have just mentioned by name. And of course, the *characteristics* signified by the P of this proposition are not the same as those signified by the S.

In

$5+7=3\times4$

$(=$Any $5+7$ /is/ equal to any $3\times4)$,

the application of S (any $5+7$) is identical with the application of P (equal to any 3×4). If it were *not* identical, if *equal to any* 3×4 had an application wider or narrower, or in any way other than the application of *any* $5+7$, then the Copula would be *is not*. For there would be no imaginable ground left for affirming P of S, seeing that the two Terms

differ in signification—that is, they could not be similarly defined.

In

No rose is without a thorn

(= Any rose is-not without a thorn),

the Subject (any rose) differs in meaning from the Predicate (without a thorn), and the *application* of the two terms is, not identical but distinct.

Again, in

Some flowers are-not fragrant,

while S (some flowers) and P (fragrant) differ in Signification, they also differ in Application—the objects referred to by S and by P are altogether distinct.

So, in

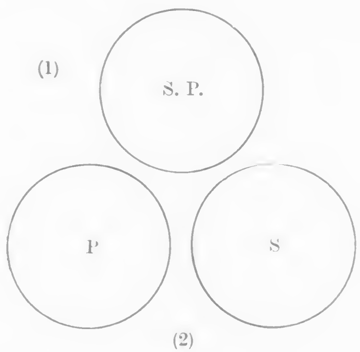
Courage is-not Rashness,

Collingwood is-not my cousin,

in each proposition, S and P are distinct in Application and diverse in Signification.

If we take the simplest symbolical expression of Categoricals (affirmative and negative), it is clear that the above-given definition and analysis apply to them. In *S is P*, there is identity of Application, together with diversity of Signification between S and P; P refers to the same object or objects that S refers to; but the character of P is diverse from the character of S. In *S is not P*, the identity of P with S is denied: and their signification is diverse.

This may be diagramatically represented thus :—



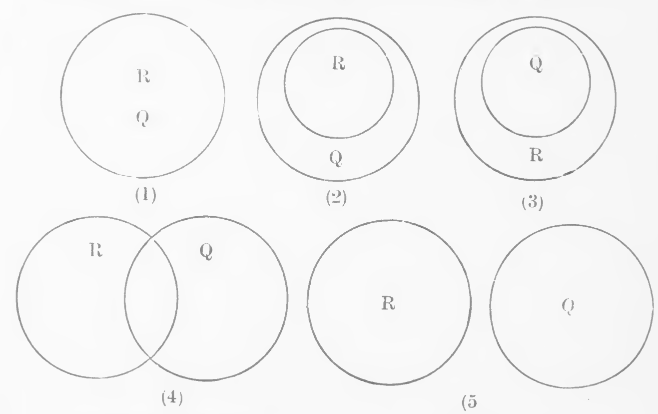
S is P (1), and *S is not P* (2), represent every possible Categorical Proposition. Therefore in any affirmative Proposition, what is P must be regarded as *identical* (in application) with whatever is S; and in negatives, whatever is P must be regarded as *distinct* (in application) from whatever is S. In propositions which have Common (or Class) Names for Term-names, this analysis of course holds, as well as in all other cases; S and P are in every case identical or distinct in Application. *E.g.* in All R is Q, *All R* is Subject, and *Q* is Predicate, what is referred to by All R (whatever it is) is identical with what is referred to by Q (whatever that is). Otherwise, of course, we should simply have to say, All R *is-not* Q. Similarly with Some R is Q, *Some R* is Subject, and *Q* is Predicate, and Subject and Predicate are in each case

identical though diverse. And in No R is Q (=Any R is-not Q) and Some R is-not Q, Subject and Predicate are both distinct and diverse.

The question of the relation between the *classes* referred to by the term-names, in such propositions as these, is clearly a different question from that concerning the relation between the *terms* and that which the terms refer to. While the 'relation' in the latter case can be of two kinds only, the relations between two classes may be of five kinds.

For instance, if we take R and Q to symbolise two Class-names, we may have the following relations of Application between them :—

(1) R may completely coincide with Q; (2) R may be included in Q; (3) R may include Q: (4) R and Q may intersect; (5) R and Q may exclude each other.[1]



[1] Cf. Keynes, *Formal Logic*, second edition, Part II. chap. vi.

Of the Class Propositions given above *All R is Q* may be represented by (1) or (2); *Some R is Q* may be represented by (1), (2), (3), or (4): *Some R is-not Q* may be represented by (3), (4), or (5): *No R is Q* is represented by (5). These four Class Propositions are called respectively A (Universal Affirmative), I (Particular Affirmative), E (Universal Negative), and O (Particular Negative). The Division into Universal and Particular is according to Quantity; that into Affirmative and Negative is according to Quality.

Further reference to these considerations will be necessary when we come to consider Immediate Inference (Eduction) as applied to Class Propositions.

The above account of Categorical Propositions is confirmed by a consideration of the forms *A is A*, *A is not A*. While *A is A* has frequently been supposed to have a meaning, *A is not A*, taken strictly, has always been regarded as on a similar footing to Aa, Round-square, or any other complex of contradictions, for while the Negative Copula asserts the *distinctness* or *other-ness* of the S and P, their exact similarity of signification involves *identity*. *A is-not A* is therefore a form which is self-contradictory. (And similarly with *A is not-A*, only that here Identity is asserted by the Copula while Otherness is involved by the Terms.) But *A is A* wants a little more examination, because it has been so widely regarded as having a meaning, and an important meaning. We need to ask, What thought, what truth, or what assertion is it that can correspond to, or be expressed by, this form of speech?

Let us take a sentence of the form *A is A*, in which A is significant—*e.g.* Whiteness is whiteness, or This tree is this tree. In using these forms of words, how do I go beyond what is involved in the mere enunciation of the words *whiteness*, *this tree*? That *whiteness* and *this tree* should BE *whiteness* and *this tree* respectively, seems not a significant assertion, but a presupposition of all significant assertion—as *extension* is a presupposition of *colour*, or *ears* of sound. And if in perceiving *whiteness* or thinking of *this tree* I ever need to assert that *whiteness is whiteness*, or that *this tree is this tree*, do I not just as much need to assert the same sentence separately for both S and P in each case? And at what point is the process to stop? And if identity needs to be asserted for the *Terms*, does it not equally need to be asserted for the *Copula*? If we need to declare that *whiteness is whiteness*, etc., do we not also need to declare that *Is* is *Is*? Unless we can start by accepting Terms and Copula as having simply and certainly a constant meaning, we can never start at all. But notwithstanding all this, it is still true that sentences of the *form* 'A is A' are sometimes used, and are understood to have a meaning. Take, for instance, such phrases as 'Cards are Cards' (Sarah Battle), 'A man's a man (for a' that),' 'A bargain's a bargain.' All these sayings are purely tautological and unmean-

ing in *form*, but in using or interpreting them we take the S in mere Application, and the P in mere Signification, and thus put a meaning into them which is not fairly expressed by their absolute tautology. For instance, in the last phrase what would be meant is probably, A bargain /is/ something that must be held to and carried out,—but this is not a statement that can be properly symbolised by A /is/ A.

Both terms of an affirmative Categorical cannot be taken solely in Application, for if so, every *S is P* must be reducible to *S is S*, since S and P have identical application, apply to the very same objects. Neither can they be both taken *solely* in Signification: for, in this case again, every proposition would be of the form *S is S*—since any characteristics, S, cannot be asserted to be diverse characteristics, P. And it would follow that the only possible negative Categoricals would be of the form *S is-not not-S*, which is equally unmeaning with *S is S*.

In any Categorical Proposition, the Application is sufficiently indicated by the S: identity or non-identity of Application, as between S and P, is indicated by the Copula; while diversity of Signification comes into view only when the P is enunciated. In regard to any Categorical assertion, we want to know, in the first place, *what it is* of which something is affirmed or denied; this knowledge is given with the enunciation of the S, which indicates the thing or things spoken of. We want, in the second place, to know

what it is that is affirmed or denied of the thing or things indicated by the S. This information is supplied by the P—that is, by its Signification, since it is evident that in affirmative propositions the Application of the P is identical with, in negative propositions is altogether distinct from, that of the S (*cf.* My brother's dog is a mastiff, My brother's dog is not a boar-hound). Hence it seems clear that in the P of any proposition, it is naturally and inevitably Signification and not Application which is prominent.

To sum up the results of this Section so far: What a Categorical Proposition imports is complete Identity or complete Distinctness (Otherness) of Application, in Diversity of Signification—that is, what the P applies to in affirmative propositions is the same thing as what the S applies to, but the characteristics by which the S refers to it are diverse from the characteristics by which the P refers to it. The affirmative Copula imports identity, and identity can only be identity of Existence (or Application). This identity can only be expressed or apprehended in diversity—that is, in difference of characteristics. The pencil with which I am now writing may be the identical pencil with which I wrote yesterday, but it can be referred to as 'identical' only because it is thought of as having some permanence of existence. Indeed, that a thing should have *some* permanence, seems necessary in order for it to be a thing at all. In negative Propositions, what the P applies to is *not*

what the S applies to, and what the S signifies is not what the P signifies.

CLASSIFICATION OF CATEGORICAL PROPOSITIONS.

All Categorical Propositions may be divided, in the first place, into Coincidental and Adjectival, the latter having a Uni-terminal Term for P. Coincidental and Adjectival Propositions have similar subdivisions. The principal of these are (1) Whole, (2) Partial: Whole and Partial subdivide, each, into Attribute, Proper, Unique, Special, and Common Propositions (*cf.* Table). Whole Propositions may be singular or plural: and, among the latter, those which are Proper, Unique, or Special, may be distinguished as General (*e.g.* All the Dawson-Wilkinsons have arrived, All the Graces are included, All the days of the week are mapped out); while the plural Whole Propositions which have Common Names for Subject-name are Universal (*e.g.* All hazel-nuts are ripe in September, All squirrels are playful). Further distinctions and subdivisions are possible; those of most logical interest are Definite and Indefinite, Relative and Absolute, Distributive and Collective. Those trees are old, All flowers are not in one garland, are Definite Propositions; Any shilling is worth twelve pence, Some ripe fruits are sour, are Indefinite; All the seasons of the year are four, is Relative; A barking dog seldom bites, is Absolute; All the seasons of the year are four, is Collective; Some ripe fruits are sour, is Distributive.

The Divisions given in the Table, and Definite and Indefinite Propositions, receive their titles from the character of their Subject-Term; Relative Propositions are those of which either Term is Relative; Absolute, those of which both Terms are Absolute. A Collective Proposition is so called because the P applies only to the S taken collectively (*e.g.* All the angles of a triangle are equal to two right angles), whereas in a Distributive Proposition the P may be asserted of every part or member of the class indicated by the Subject-name (*e.g.* All the angles of a triangle are less than two right angles).

There is finally the universally applicable distinction into Affirmative and Negative Categoricals, and this depends upon the affirmative or negative quality of the Copula.

Differences in use (depending on differences of relation to other propositions) are connected with the differences in form of the various kinds of Categorical Propositions distinguished above. These differences will be sufficiently obvious when we come to the consideration of Inferences, both Mediate and Immediate. For instance, from Distributive Universals, and from them alone, both Distributive Universals and Particulars can be immediately inferred. And to reach by Inference (Mediate or Immediate) an Universal Proposition, we must always start from an

Universal; to reach a General, we must always start from a General—and so on. Again, every Categorical Syllogism expressing an 'Inductive' argument—an argument in which, by help of particular instances, we reach and establish a new law—has an Universal Proposition for the Major Premiss and the Conclusion. When General Propositions and the corresponding Particulars are converted, the Predicate Terms of the new propositions obtained by this conversion must have indicators the same as, or equivalent to, those which they had as Subject Terms of the old (converted) propositions. For example, the Proposition, *All of my pupils have passed* converts to *Some who have passed are all my pupils; The planets are bodies having an elliptical orbit* converts to *Some bodies having an elliptical orbit are the planets*; *Some of Rembrandt's pictures are master-pieces* converts to *Some master-pieces are some of Rembrandt's pictures.* In such cases as these, the omission of the Term-indicator in the new Predicate would entirely alter the force of the proposition.

TABLE III.

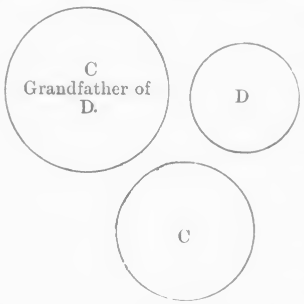
CATEGORICAL PROPOSITIONS (COINCIDENTAL AND ADJECTIVAL).

- *Whole Propositions.*
- *Partial (or Particular) Propositions.*
  - *Attribute Propositions.* *E.g.* Hypocrisy is odious; Some kindness is misplaced; This injustice has seldom been equalled.
  - *Substantive Propositions.*
    - *Proper and Unique Propositions.* *E.g.* One of the Crichton-Brownes had not returned; All the Harringtons are gone to Switzerland; James Merivale is ill; All the Apostles were Jews; One of the Graces was Thalia.
    - *Special Propositions.* *E.g.* The days of the week are seven; One of the Predicables is *species*.
    - *Common Propositions.* *E.g.* All men are liable to misfortune; All flowers are not in the same garland; Some oaks are evergreen.

SECTION IV.

RELATIVE CATEGORICAL PROPOSITIONS.

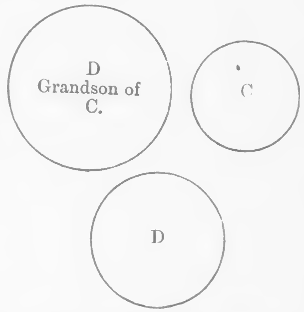
I MENTIONED above (*cf. ante*, p. 14) the connection between what are called *A fortiori* Arguments and Relative Terms—Terms referring to some 'System.' A Proposition which has one such Term for S or P or both, besides the ordinary Immediate Inferences (Eductions) which can be drawn from it in just the same way as from Absolute Propositions, furnishes other immediate inferences to any one acquainted with the system to which it refers. These inferences cannot be educed except by a person knowing the 'system': on the other hand, no knowledge is needed of the objects referred to, except a knowledge of their place in the system, and this knowledge is in many cases co-extensive with ordinary intelligence; consider, *e.g.* the relations of magnitude of objects in space, of the successive parts of time, of family connections, of number. From such a Proposition as



C /is/ the grandfather of D,

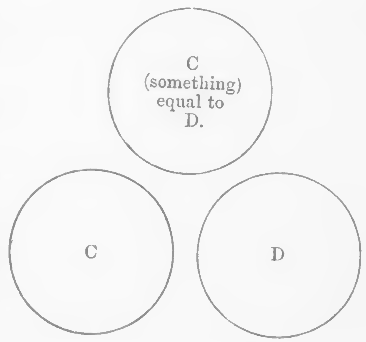
in addition to such inferences as could be drawn from an Absolute Proposition (The grandfather of D is C, Not the grandfather of D is Not-C, etc.), it is possible for any one having the most elementary knowledge of family relationship to infer further that

D /is/ the grandson of C,
A parent of D /is/ a child of C,
A child of D /is/ a great-grandchild of C,
The father of C /is/ the great-grandfather of D, etc.



From C /is/ equal to D (besides Something equal to D /is/ C, No not-equal to D /is/ C, etc.) it can be inferred that

D /is/ equal to C,
C /is not/ less than D,
D /is not/ greater than C,
C /is not/ greater than D,
Whatever is greater than C /is/ greater than D,



and so on (compare C /is/ an inference from D).

In each of the above examples we are not dealing with one object or group in the same way as in Absolute Propositions—*e.g.*,

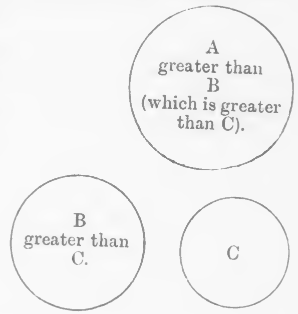
All men /are/ mortal
Byzantium /is/ Constantinople
This bird /is/ a lark—

we are now considering, besides the identity of application of S and P, two objects numerically distinct, namely C and D. The S and P of each proposition have of course, as just observed, the same application; but an inspection of the terms (when they are understood) enables us to know that in each case we are concerned with two things (two Subjects of Attributes, or two Attributes), related in a certain way, while of the examples last given this cannot be said. In each of the Relative Propositions given, what is predicated of the S is *its relation to another object*, and we are able to take *that other object* and predicate of it *its relation to the first object*. And where we have two Relative Propositions as premisses, we may be concerned with three distinct objects, and the relations between them; and the point of union may be in one of the objects, to which both of the others are related.

These considerations account for the distinctive

character of Mathematical and *A fortiori*, etc., arguments. Every such argument can be expressed (at greater or less length) by help of Immediate Inference (Eduction), or by rigid Syllogism, or by a combination of both—propositions being used that state explicitly principles or laws of the systems referred to, which, in the ordinary conveniently abbreviated form, are only implied. *E.g.* in

A /is/ greater than B
B /is/ greater than C
A /is/ greater than C,



(where we have four term-names), the reasoning may be expressed by a Conditional Syllogism, thus:—

If anything (A) /is/ greater than a second thing (B), which (B) is greater than a third thing (C); that thing (A) /is/ greater than the third (C):
This thing (A) /is/ greater than a second thing (B), which (B) is greater than a third thing (C):
This thing (A) is greater than the third thing (C).

This Conditional may, of course, but with increase of awkwardness, be reduced to the Categorical form.

Among the most important of Relative Propositions are certain Mathematical or Quantitative Propositions; and with reference to these the question arises, What

is the Term-indicator and what the force of the Copula = in them?

Take, *e.g.*,

(*a*) $2+3=6-1$

I.—And *first* let $2+3$ and $6-1$ mean $2+3$ and $6-1$ *of an assigned unit* (*e.g.* apples, beads on a wire). Then, taking = as signifying *is equal to*, and $2+3$ $6-1$ as signifying 2 *units together with* 3 *units*, 6 *units minus* 1 *unit*, may we read (*a*), with the Subject taken distributively, as

Any $(2+3)$ = some $(6-1)$

(*i.e.* any $2+3$ /is/ equal to some $6-1$ *of the assigned unit*)?

We clearly could not have

Any $(2+3)$ = any $(6-1)$,

because the objects denoted by the Predicate in that case might be *the very same objects* denoted by the Subject, in which case the Copula = would be inappropriate, since a thing cannot be said to be *equal to itself*.

And if, taking S and P collectively,[1] we interpret (*a*) to mean

All $(2+3)$ = all $(6-1)$,

on this view we might have

All (1) = all $(1+2+3+\ldots$ to $\infty)$;

for *All 1's*, taken collectively, embraces *all units*, however grouped.

[1] This collective interpretation is suggested by Mr. Monck, *Introduction to Logic*, p. 19.

Again, if we took 1, 2, etc. collectively to mean All 1's, All 2's, etc., we might have

$1+1=1$ (cf. Boole's scheme),

$1+1+1=1$,

$1+1=1+2+3+\ldots$ to ∞,

and so on. But such interpretations would not be admissible in Mathematics, and the appropriate copula here would be *is*, not =.

If, however, we say that $2+3=6-1$ means

Any $(2+3)$ = some $(6-1)$

there arises the difficulty that Simple Conversion (as commonly applied with the Copula =) would give us a proposition of this form—

Some $(6-1)$ = any $(2+3)$,

which would not be valid for the reason which prevented our accepting

Any $(2+3)$ = any $(6-1)$.

We might have

Some $(2+3)$ = some $(6-1)$,

or

These $(2+3)$ = those $(6-1)$, etc.

But here the universality which we attribute to Mathematical Propositions is wanting.

If we were to interpret = as meaning *is-equal-to-or-identical-with* (= is-or-is-equal-to), then we could say

Any $(2+3)$ = any $(6-1)$,

and our proposition would be universal, convertible and fitly expressed.

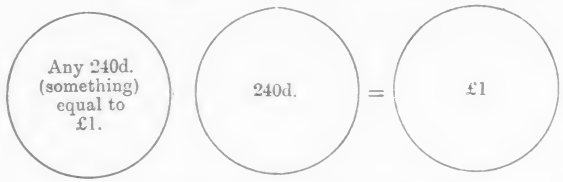
If we are dealing with *assigned units of different*

values and having certain fixed ratios to each other, then the copula = is inevitably restricted to mean only *equal to*—

E.g. 240 pennies = £1—

for here identity between the elements separated by = is impossible; what the proposition means is,

Any 240 pennies /is/ [something] equal to any £1.



II.—If, however, instead of referring to any assigned units, we regard the figures in question as having the most general or abstract application possible, and take

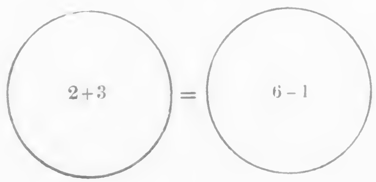
$2 + 3 = 6 - 1$

to mean

The numbers $2 + 3$ = the numbers $6 - 1$,

the difficulties above referred to do not arise. Thus understood

$2 + 3 = 6 - 1$



is equivalent to

any $(2 + 3)$ /is equal to/ any $(6 - 1)$

(*Equal* being taken to mean *exactly similar quantitatively*, while *identical* (*numero tantum*) means *the very same thing*. Thus a thing would be equal to *some other thing*, identical with *itself*).

SECTION V.

INFERENTIAL PROPOSITIONS.

INFERENTIAL PROPOSITIONS are of the form

If A, C —

e.g.
- If E is F, E is H
- If E is F, G is F
- If E is F, G is H
- If any E is F, that E is H, etc.

If E is F, If any E is F, are called Antecedents (A); E is H, G is F, G is H, that E is H, are Consequents (C).

An INFERENTIAL PROPOSITION may be defined as—

> A Proposition expressing a relation between Antecedent and Consequent such that an identity (or identities) expressed or indicated by the Consequent is an inference from an identity (or identities) expressed or indicated by the Antecedent.

The class of Inferential Propositions may be divided into two distinct species, called respectively (1) Hypothetical, (2) Conditional (*cf.* Keynes, *Formal Logic*, 2nd ed. pp. 64, 65, 67, etc.).

(1) differ from (2) in this, that both A and C express (or indicate) a complete Categorical Proposition. *E.g.*—

If you are right, he is a good man,

If E were F, E would be H.

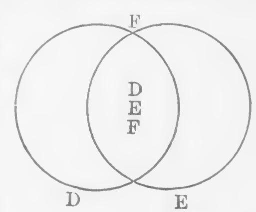
The A and C of Hypotheticals are comparatively independent assertions, while the A and C of Conditionals are comparatively dependent, and incomplete. Take, *e.g.*, the Conditional

If any flower is scarlet, it (= that flower) is scentless.

Any flower is scarlet, the A of this proposition, if asserted in isolation, is equivalent to *all flowers are scarlet*; but this is not the meaning which it has as Antecedent. And *that flower is scentless*—the Consequent—has obvious reference to that which has gone before, and is obviously incomplete in itself. (*Cf.* If any violet were scarlet, it would be scentless.)

A CONDITIONAL PROPOSITION may be defined as—

> A Proposition which asserts that any member of a class indicated by a given name and distinguished in some particular way, may be inferred to have also some further distinction.



If any D is E, that D is F, is the simplest unequivocal expression for a Conditional, as distinguished from a

Hypothetical. It is a form in which every Conditional can be expressed. *E.g.*—

If you pull the trigger of a gun it will go off

reduces to

If any gun has its trigger pulled [by you], that gun will go off.

If he told you anything, it is true

reduces to

If anything was told you by him, that thing is true.

A Hypothetical Proposition may be defined as—

A Proposition in which two (expressed or indicated) Categoricals (or combinations of Categoricals) are combined in such a way as to express that one (the Consequent) is an inference from the other (the Antecedent).

It may be observed that this inferential relation can only obtain between propositions that differ from each other but are not incompatible.

The import of an Inferential may be expressed approximately in a Relative Categorical. *E.g.*—

If E is F, G is H

is expressible as

G is H /is/ an inference from *E is F*.

This proposition may be compared with such a proposition as

E /is/ larger than *F*.

In both cases there are two non-identical elements (G is H—E is F, E—F) having a certain relation to

each other; and in both cases certain fresh propositions may be inferred in addition to such as are inferrible from *all* categoricals. The following are examples of equivalent Inferentials and Categoricals:—

(1) If you are disappointed, I am sorry.

(2) If all men were perfect, all men would be infallible.

(3) If any bird is a thrush, it is speckled.

(1) = That I am sorry is an inference from your being disappointed.

(2) = That all men are infallible is an inference from their being perfect (perfect creatures being infallible).

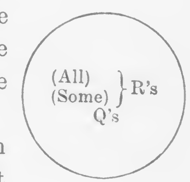
(3) = That any bird is speckled is an inference from its being a thrush.

(3) May also be naturally expressed as an Absolute Categorical. *E.g.*

Any bird that is a thrush /is/ speckled.

Hypothetical Propositions may be divided as follows:—

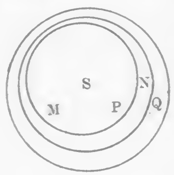
(1) Formal or Self-contained Hypotheticals—*i.e.* those in which the Consequent is an inference from the Antecedent alone—*e.g.* If all R's are Q's, some R's are Q's.[1]



(2) Referential Hypotheticals—in which the Consequent is inferred, not

[1] Hypotheticals of this class are self-evident, and the attempt to deny them produces a self-contradictory statement.

from the Antecedent alone, but from the Antecedent taken in conjunction with some other unexpressed proposition or propositions. They may refer to either (*a*) only one unexpressed proposition, as in



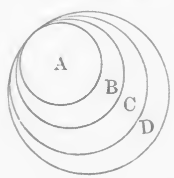
If M [these N] is P [some Q], S is P (∵ S is M);

or they may refer to (*b*) more than one unexpressed proposition, as in

If that rope did not break, the knot must have come undone.

This account of Hypothetical Propositions involves the view that the terms contained in any Hypothetical are all to be identified in application, either directly as in (1), or indirectly as in (2). For instance, in the example last given, the whole reasoning implied may be as follows:—

That rope (*A*) was a rope binding together climbers who fell apart (*B*).



A rope binding together climbers who fell apart (*B*) must have given way (*C*);

Having given way (*C*) it must have broken or the knot must have come undone (*D*);

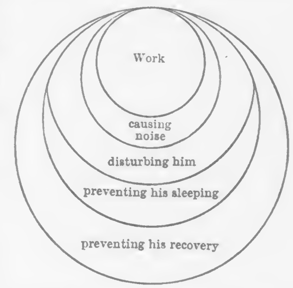
∴ That rope (*A*) must have broken or the knot must have come undone (*D*).

Again, in

If the work goes on, he will not recover,

the reasoning involved may be as follows:—

If the work goes on, great noise will be made; If great noise is made he will be disturbed by it; If he is disturbed he will not be able to sleep; If he is not able to sleep he will die.

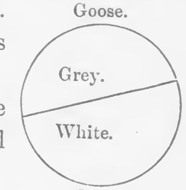


Conditional Propositions may be divided into—

(1) Divisional Conditionals, in which it is asserted that if any member of a specified class does not belong to a subdivision indicated by the P-name of the Antecedent, it may be inferred to belong to one indicated by the P-name of the Consequent. *E.g.*

If any Goose is not Grey, it is White.

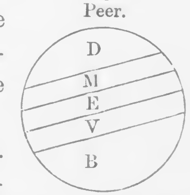
Goose.



If any Peer is not a Duke, he must be a Marquis or an Earl or a Viscount or a Baron.

(These correspond to, and are derivable from Divisional Alternatives, to which also they may be reduced.)

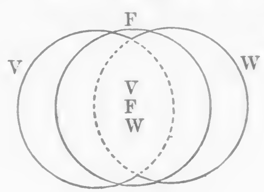
Peer.



(2) Quasi-Divisional Conditionals. In these the species got by combining the Term-names of the S and P of the Antecedent is referred to the class indicated by the P of the Consequent; but the Predicates of

Antecedent and Consequent do not indicate (as in Divisionals) a complete division of the class denoted by the Subject of the Antecedent.

The following are examples of (2):—



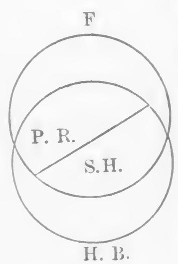
(*a*)

(*a*) If any Violet is White it is Fragrant;

(*b*) If any Fowl is a Spangled Hamburgh, it is Silver or Golden;

(*b*)

(*c*) If any Fowl is a Plymouth Rock or a Spangled Hamburgh, it is a Handsome Bird.



(*c*)

(We cannot tell from the mere form of a Conditional without reference to the force of the Terms, whether it is Divisional or Quasi-Divisional; but when we know the meaning and application of the terms, we can deduce more inferences from the Divisional Propositions than from the others. *E.g.* from the two Divisional Propositions given above, we can draw up complete Divisions of the Class *Goose* and the Class *Peer*).

The distinction between Hypothetical and Conditional Inferentials becomes very marked when a

proposition of either kind is taken as Major Premiss in a Syllogism which has a Categorical Minor and Conclusion (*cf. post,* Section XIV. and Table IX.).

With a Hypothetical we get—

If A, C;
A (or not-C);
C (or not-A).

If, *e.g.*,
A = Honesty is not-the best policy,
C = Life is not-worth having,

our Syllogism runs—

If Honesty is not the best policy, Life is not worth having;
Honesty is not the best policy (or Life is worth having);
Life is not worth having (or Honesty is the best policy).

But taking a Conditional Proposition as Major Premiss, we do not for Minor simply affirm the A or deny the C, nor for Conclusion simply affirm the C or deny the A; but we bring in a fresh term as Subject in Minor Premiss and Conclusion. *E.g.*

If any town has a Cathedral, it is a City;
The town of Hereford has a Cathedral;
The town of Hereford is a City.

A concrete Syllogism having a Conditional Major and a Categorical Minor and Conclusion is always reducible (though the reduction may be troublesome) to the form—

If any D is E, that D is F;
XD is E (or XD is not F);
XD is F (or XD is not E).

The real S of the Antecedent of any Conditional is always Indefinite Universal—the S-name of the Minor and Conclusion generally has either a definite (particular) Term-indicator (*e.g.* this, those), or is distinguished from the S-name of the Antecedent by some distinctive attribute. We may have a Syllogism of the form

> If any D is E, that D is F:
> *Some* D is E;
> *Some* D is F—

but it is unusual.

TABLE IV.

INFERENTIAL PROPOSITIONS.

- *Hypothetical Propositions.*
  - *Formal (or Self-contained) Hypothetical Propositions.* *E.g.* If all R's are Q's, some R's are Q's.
  - *Referential Propositions.* *E.g.* If all N's are Q's, all R's are Q's; If all men are not mere animals, they are spiritual beings; If A is B, C is D.
- *Conditional Propositions.*
  - *Divisional Propositions.* *E.g.* If any goose is not-grey, it is white.
  - *Quasi-Divisional Propositions.* *E.g.* If any flower is scarlet, it is scentless.

SECTION VI.

ALTERNATIVE (OR DISJUNCTIVE) PROPOSITIONS.

ALTERNATIVE PROPOSITIONS are of the following forms—

(1) S is Q or T:
Any Topaz is pink or yellow—

(2) D is E or F is G;
Relief must come quickly or we must give up hope—

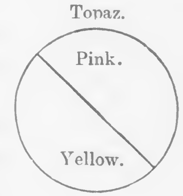
(3) X or Y is P;
Colin or Robin is coming—

(4) X is Q or X is T—

(5) P is S or S is not P.

(4) would generally be expressed (when significant terms are used) in the same form as (2), but this would be in order to avoid the awkwardness of re-iterating in the second alternative the Subject of the first, instead of replacing it by a pronoun. *E.g.* instead of saying (*a*) The President will be here or the President must be ill, we should naturally say (*b*) The President will be here or he must be ill; but (*a*) and (*b*) have a precisely similar meaning.

We could not, however, express (2) in the form of (4).



And we could not put (1) into the form of (4). Any Topaz is pink or any Topaz is yellow, does not convey the meaning of (1), which is, Any Topaz is pink or [*being not pink* is] yellow. Alternatives of this form correspond to Conditionals, and in them the Alternation does not indicate ignorance or indeterminateness, but simply indicates the subdivisions to some one of which any and every member of a given class must belong. Also in these Alternatives we find that the reciprocal dependence between the two parts of the proposition is even more prominent than in the corresponding Inferentials. There is no important difference between (3) and (2); and (3) may be expressed as, X is P or Y is P, without alteration of force; but since this expression is both awkward and unnecessarily long, the elliptical form (3) is generally used.

When the X in (4) is an Universal Term, the Alternatives may be called Subsumptional, because the *Subject* common to the Antecedent and the Consequent is referred to the *Predicates* of Antecedent and Consequent, as a Species to Alternative Genera; *e.g.* All men are spiritual beings or mere animals. Alternatives of form (5) may be called Formal (*cf.* Keynes, *Formal Logic*, 2nd edition, p. 40) or Self-contained.

Any Alternatives which are not Formal, Subsumptional, or Conditional may be called Contingent. *E.g.* The author of these plays is Bacon or Shakespeare: A is B, or C is D. All Formal, Subsumptional, and Contingent Alternatives reduce to Hypotheticals.

We may notice that *or* is sometimes used for *and* in order to avoid ambiguity—*e.g.* All the books in red or yellow covers are to be bound in morocco; if it were said 'in red *and* yellow,' the meaning would not be clear. This proposition is plainly not Alternative in meaning, but an elliptical way of expressing a simple conjunction of Categoricals—namely,

All the books in red covers are to be bound in morocco,
All the books in yellow covers are to be bound in morocco.

Alternatives must always have some element of exclusiveness, otherwise there is no true alternation: as far as alternatives are absolutely unexclusive, our 'Alternation' is of the form *A or A*, which means no more than A simply. Where the elements of an Alternation are Propositions, there must be some difference of meaning (however slight) in the Propositions (or there is no alternation) and so far there is exclusiveness; but alternatives may be true together, and so far there is unexclusiveness. *E.g.* in

XY is a knave, or *XY* is a fool,

there is the indispensable element of exclusiveness; *i.e.* there is difference of signification; there is also an undoubted possibility of unexclusiveness, in the sense that *both* predicates may be true of XY. Where the alternatives are Terms, there may be unexclusiveness of application, but there must be some exclusiveness of signification or characteristics. *E.g.* in

Any voter is a householder or a ratepayer,

the application of *householders* and *ratepayers* is to some extent coincident; but in signification the two terms are exclusive—that is, they would be differently defined, the signification of the one is different from that of the other.

There is no escaping the admission that *in as far as* any alternation cannot be reduced to a strictly exclusive form, the alternation vanishes, just as in *S is P*, all significance of assertion would vanish if *P* turned out to signify *S*.

An ALTERNATIVE PROPOSITION may be defined as—

A Proposition in which a plurality of differing elements (connected by *or* and called the Alternatives) are so related that *not all* of them can be denied, because the denial of some justifies the affirmation of the rest.

Whately remarks (*Elements of Logic*, p. 67, 9th edition) that 'A Hypothetical Proposition is defined to be *two or more Categoricals united by a Copula* (conjunction).' This definition, taken without restriction, would include a vast number of combinations not commonly called Hypotheticals; but I mention it here in order to draw attention to the fact that the Categorical form of proposition is fundamental—the

elements of Hypotheticals, Conditionals, and Alternatives being Categorical or Quasi-categorical. It would thus be *possible* to regard all Logic as concerned with Categoricals and their combinations—but this treatment would not be in accordance with common usage, or convenience, not to mention the ordinary practice of logical text-books.

TABLE V.

ALTERNATIVE (OR DISJUNCTIVE) PROPOSITIONS.

Conditional Alternative Propositions. *E.g.* Any goose is grey or white; Any flower is scentless or not-scarlet.	*Formal (or Self-contained) Alternative Propositions.* *E.g.* S is P, or P is not S; A is B, or A is not B; Some R's are Q's, or some R's are not Q's.	*Subsumptional Alternative Propositions.* *E.g.* All men are spiritual beings or mere animals.	*Contingent Alternative Propositions.* *E.g.* A is B, or C is D.

SECTION VII.

QUANTIFICATION AND CONVERSION, AND THE MEANING OF *SOME*.

Before passing on to Immediate Inferences, it will be as well to give a brief consideration to the subject of Quantification, in ordinary Class Propositions of the A, E, I or O form. Such propositions commonly have some sign of quantity attached to the Subject and not to the Predicate, and are said to have a quantified Subject and an unquantified Predicate. It has been held by certain reformers in Logic that all Predicates are naturally quantified in thought, and ought to be explicitly quantified in speech. This view does not seem to be borne out by reflection; but careful reflection does appear to show that Quantification [1] is an indispensable instrument of Conversion.

The place of Quantification in Logic is very curious, its function being often as completely hidden from those whose processes of Conversion involve it, as the subterranean course of a train in one of the

[1] By *Quantification* (1), *quantificate* (2), is here meant (1) *quantifying of the Predicate*, (2) *to quantify the Predicate*.

loop-tunnels of the Swiss Alps would be to an observer who only saw it rush into one opening, and emerge again in a few minutes from another, just above or just below. My meaning will be best elucidated by taking an ordinary proposition and tracing the changes which it undergoes in Conversion.

Let the proposition be—

All human beings are rational (1)

The ordinary converse of this is—

Some rational creatures are human beings (2),

or—

Some rational creatures are human (3).

(3) is perhaps the more perfect converse, because (1) and (3) resemble each other in having an Adjectival Term for P, while (2) has a Substantive Term for P. (1) and (3) are Adjectival Propositions, (2) a Coincidental Proposition. Adjectival Propositions cannot be converted (*cf. ante*, p. 15). If I alter the relative position of S and P in (1) as it stands, and say—

Rational are all human beings,

it is clear that Conversion in the logical sense has not taken place; for *Rational* is still the Predicate, and *all human beings* is still the Subject. The proposition has been merely turned round. No Conversion of (1) while it is (1), that is, while it retains the Adjectival form, is possible. But it may be put into the corresponding Coincidental form—

All human beings are rational creatures (4):

and with this (4) we can deal. *It* is not, however, any more than the Adjectival (1), directly convertible. If altered into—

Rational creatures are all human beings,

the proposition thus obtained, besides being awkward, is ambiguous—it is by no means clear which term is to be taken as Subject, and the *all* might even be understood to qualify (or quantify) *Rational creatures.*

The first step towards real Conversion is taken when we pass from the unquantificated Coincidental (4) to the quantificated proposition—

All human beings are some rational creatures (5).

From this we go on to the quantificated converse—

Some rational creatures are all human beings (6):

and from (6) to the unquantificated converse of (5)—

Some rational creatures are human beings (7).

From (7) we can pass to the corresponding Adjectival Proposition—

Some rational creatures are human (8).

It is to be observed that in going from (4) to (7), we have not only inserted a sign of quantity before the new Subject-name (rational creatures) which, as the old Predicate, had not any to start with; we have also dropped the sign of quantity which the new Predicate (human beings) had when it was the old Subject-name. Thus, as we began with an unquantificated proposition, so we end with an unquantificated proposition. The propositions which logicians (on the

whole) have recognised and dealt with are unquantificated propositions: it is for enabling us to pass (by an elliptical procedure) *from* unquantificated *to* unquantificated propositions that the ordinary rules of Conversion and Reduction of Class Propositions and Syllogisms are framed; it is of unquantificated propositions that the 'nineteen valid moods' of the traditional Categorical Syllogism are composed. It is hardly necessary to remark that in ordinary speech it is almost always unquantificated propositions that are used when we are dealing with Common names.

In converting an E proposition, we should proceed as follows:—Let the proposition to be converted be, No R is Q (1). (1)=(2) Any R is not Q (by grammatical equivalence). Quantificating (2) we get, Any R is not any Q (3). (3) converts to, Any Q is not any R (4). By disquantificating (4) we reach (5), Any Q is not R. And (5) =No Q is R (by grammatical equivalence).

My view is that the usage of Logic and of ordinary speech is on the whole to be justified,[1]

[1] It is this usage of both Logic and ordinary speech, I think, which explains the common failure to distinguish between Terms and Term-names. Taking, *e.g.*, the proposition *All R's are Q's* (1), our Terms, so far as expressed, are—(*a*) All R's, (*b*) Q's. Converting (1) we get (2), Some Q's are R's, and here our expressed Terms are (*c*) Some Q's, (*d*) R's—hence all R's and R's, Some Q's

and yet that Quantification is possible and valid in a subordinate office, as a necessary transformation stage of propositions. This can be made clear by reference to the Import of Categorical Propositions. What a Categorical Proposition affirms or denies is, it seems, *identity of application* of the S and the P in *diversity of signification*. Application of S and of P in an affirmative Categorical Proposition are the same: signification of the S and P being, of course, always diverse, unless we admit propositions of the form *A is A*, and being in any case diverse in all propositions of the form *A is B*. And application is sufficiently indicated by the S; *identity* or *otherness* is indicated by the Copula: while *diversity of signification* comes into view only when the Predicate is enunciated. In regard to any assertion, we want to know in the first place *what it is* of which something is affirmed or denied; this knowledge is given with the enunciation of the Subject, which indicates the thing or things spoken of. We want, in the second place, to know *what it is that is affirmed or denied of the thing or things* indicated by the Subject. This information is supplied by the Predicate—that is, by its signification

and Q's, are indiscriminately called *Terms*. And a further point which throws light upon this, and also upon the appropriateness of the traditional Canon and Rules of Categorical Syllogism to *Classes* rather than to *Terms*, is that we have a practical interest in the relations of Classes (which are indicated by Term-names), and we are continually comparing propositions which have the same *Term-names*, but not the same *Terms*.

—since it is evident that in affirmative propositions the application of the Predicate is identical with, in negative propositions is altogether distinct from, that of the Subject. Hence it seems clear that in the Predicate of any proposition, it is naturally and inevitably *signification* and not *application* which is prominent. This is confirmed by the consideration that we commonly use Adjectival rather than Coincidental Propositions, if appropriate Adjectival Terms are available: and that such terms in English cannot take the sign of the plural, though the Substantive Terms which they qualify can, and though no one doubts that the application of an Adjectival Term *is* the same as that of the Substantive Term which it qualifies. It is also to be remembered that an Adjectival Term cannot be Subject in a proposition. Now if it is the primary function of the S in any Categorical Proposition to indicate application, while it is the primary function of the P to indicate signification, it seems obvious that quantifying is appropriate, and may be necessary, in the case of S, but not in the case of P, under ordinary circumstances. And a further reason against admitting Quantification (except as a transformation-stage) in most propositions, is deducible from the consideration that what propositions affirm or deny is the identity of application (in diversity of signification) of S and P; for in a quantificated affirmative, though indeed identity of the terms is still *asserted* (as it is bound to be), the fact that the *application* of both

terms is made prominent tends to obscure this—especially where *difference of extent* of the *classes* referred to is suggested. It might indeed be maintained that where *both* terms of our propositions are taken purely in application, quantificated propositions are most appropriate, being the form of proposition which makes the application of both S and P most prominent. But both terms *cannot* be taken *purely* in application. If, *e.g.*, in *S is P*, both S and P were taken *in application only*, then to say *S is P* would be exactly equivalent to saying *S is S*, for the *application* of P is the very same as that of S. But *S is S* is not (*cf. ante*, p. 27) entitled to be called a significant assertion. On the other hand, the view here advocated of the Import of Categorical Propositions justifies the recognition of Quantification as a phase of propositions. For the Predicates of propositions *have* application as well as the Subjects,[1] and (in affirmative propositions) an application which is identical with that of the Subjects. It is therefore (in a Coincidental Proposition) possible, and under certain conditions allowable and necessary, to make this prominent by quantification. And the Subjects of propositions *have* signification; and this may be allowed to come into prominence by dropping the sign of quantity (Term-Indicator) which inevitably fixes attention rather upon the application than the signification of a term.

[1] *Cf.* that in many languages (*e.g.* Greek, Latin, French) adjectives that qualify a plural Term *always take the sign of the plural.*

The above view of Quantification is confirmed and illustrated by a consideration of the traditional logical treatment of O Propositions. Of the four Class Propositions, A, E, I, O, the first three have always been regarded as capable, the fourth as incapable, of Conversion.

We have seen that propositions on their way to Conversion have to undergo the process of Quantification. But the reason why O (Some R is not Q) is pronounced inconvertible is not because there is any more difficulty in quantificating it than in quantificating the other propositions, but because, *when the quantificated converse of O* (Any Q is not *some* R) *has been reached*, the quantification cannot be dropped without an illegitimate alteration of signification. For the commonly accepted signification of the disquantificated converse of O (Any Q is not R) *implies* a quantification *different from that which has been dropped*—the *dropped* P-indicator being *some*, the P-indicator understood as involved in the unquantificated Proposition (Any Q is not R) reached by dropping it, being *any*. And as, at the same time, ordinary thought and speech will not admit the *explicitly quantificated* form, it is inevitable that a Logic which deals with the forms of ordinary thought and speech should regard O as inconvertible. To take a concrete instance: the Proposition, Some trees are not oaks (1), becomes by quantification (2) Some trees are not any oaks. This converts to (3) Any oaks are not

some trees. Dropping the quantification of (3), we get (4) Any oaks are not trees, and this would be *understood* to mean (5) Any oaks are not any trees (=No oaks are trees).

THE MEANING OF *SOME*.

If Quantification of ordinary Categorical Propositions is recognised as admissible and necessary in the process of Conversion, but a mere stage in that process, it seems desirable to inquire a little more particularly into the force and meaning of Propositions while in the quantified stage. This depends principally upon the signification given to *Some*. *Some*, it is said, may mean (1) 'Some but not all': (2) 'Some at least, it may be all.' But when the above are offered as interpretations or explanations of *Some*, the question obviously arises, What exactly does the Some in Some at least, Some at most, mean? Must not the meaning which it has *as constituent of these expressions* be its real minimum of meaning?

Again, *Some* has been defined to mean *not none*. This definition is more satisfactory than (1) or (2), since it is wide enough to cover the meaning intended by each (while (1) excludes (2) and is evidently not applicable in all cases), and also it does not present a direct and explicit *circulus in definiendo*. But I am afraid it is still open to the reproach of being circular; for how is *none* to be defined except as *not some?* And if *Some* means merely *not none*, and *None* means

merely *not some*, what do we know about either except that it is the negative of the other? *Some is not-none* contraposits [contraverts] to *None is not-some*, and if we have nothing else to say about the meaning of *None* and *Some*, we are simply revolving in a circle which is closed against all connection with other meanings.

If we ask, What is intended by, *e.g.*, *Some R*, in common speech? it must be admitted (and is recognised by logicians) that the almost invariable intention of the speaker, in any particular case, is to indicate some limitation of R making it narrower in application than All R (this must be the case, for instance, whenever it is got by Sub-alternation from *All R*); or some modification of R diverse in signification from mere R. Therefore it may be said that what is intended is *part* (*not all*) *of R*, *or certain* (*somehow distinguished*) *R*. If *All R* were *intended*, then in order that the *intended* meaning might be unequivocally conveyed, *All R* would be used. Similarly, if R unmodified were intended, R unmodified would be used.

But it must be admitted that *Some R* may *happen* to have the same application as All R; *e.g.* I may *say*, *Some* scarlet flowers are scentless; and it may *be true*, though I did not know it, that *All* scarlet flowers are scentless.

Or I may say, *Some* (=certain somehow distinguished) Cloven-hoofed animals are ruminants; and

it may turn out that I might with equal truth (whether or not I was aware of it) have asserted simply that Cloven-hoofed animals are ruminants.

The recognition of such cases as these, and of other cases, where one is fully conscious that one's knowledge is indeterminate, makes it clear that any definition of *Some* which restricts it to (1) Less-than-all, or (2) Certain-somehow-distinguished (and (1) and (2) involve each other), cannot be valid.

I propose to define *Some R* as meaning *An indefinite quantity or number of R.* Such a definition, it is clear, involves no implication either (*a*) of there being or not being *other R*, or (*b*) of what may be asserted concerning those other R, if there are any. And the definition will be found to give all the meaning that is common to *Some* in all cases, and that justifies its use—that is, it gives the whole Signification of the word.

This account of the meaning of *Some* makes the question (which is sometimes asked), Does *Some* mean One at least, or Two at least? appear irrelevant.

If *Some* means merely an indefinite quantity, quantifying by *Some* makes our *Terms* explicitly indeterminate; for it excludes (1) explicit universality, and (2) definite limitation. And it affords no definite determination of the *relations of any classes concerned.*

The reason why it can be used where *All* cannot (as in the Intraversion [Conversion *per Accidens*] of an

A proposition), is that it does not explicitly claim Universality.[1]

The function of Quantification on the whole seems to be simply to *bring into prominence the application-aspect* of the Predicate.

The words *Most*, *Few*, *All*, *Any*, are explained as follows by Dr. Keynes (*Formal Logic*, 2nd edition pp. 61-64):—'*Most* is to be interpreted "at least one more than half." *Few* has a negative force; and "Few R are Q" may be regarded as equivalent to "Most R are not Q" (with perhaps the further implication "although *Some* R are Q"). . . . *A few* has not the same signification as *Few*, but must be regarded as affirmative, and, generally, as simply equivalent to *Some*; *e.g.* A few R are Q=Some R are Q. . . . *All* is ambiguous, so far as it may be used either distributively or collectively. In the proposition, "All the angles of a triangle are less than two right angles," it is used distributively, the predicate applying to each and every angle of a triangle taken separately. In the proposition, "All the angles of a triangle are equal to two right angles," it is used collectively, the predicate applying to all the angles taken together, and not to each separately. . . . *Any* as the sign of quantity of the subject of a categorical proposition

[1] The disastrous results of quantifying with *Some* when *Some* means *Not-all, and what is asserted of part is denied of the rest*, are fully discussed in Dr. Keynes's *Formal Logic*, Part III. chap. ix. second edition.

(*e.g.* any R is Q), is logically equivalent to "all" in its distributive sense. Whatever is true of any member of a class taken at random, is necessarily true of the whole of that class. When not the subject of a categorical proposition, *Any* may have a different signification. For example, in the hypothetical proposition, "If any A is B, C is D," it has the same indefinite character which we logically ascribe to *Some*; since the antecedent condition is satisfied if a single A is B. The proposition might indeed be written,—If one or more A is B, C is D."[1]

It may be added that although in Universal and General Propositions the distributive *All* may have the same force as *Any*, yet there are certain differences —for *Any* may occur as Subject-indicator in a Proposition in which, by signification of S or P, the application of the Subject is restricted to *one* individual. *E.g.* Any one who wins this race will have a silver cup, Any person whom the committee choose will be appointed secretary, Any one may have my ticket (we could not here replace *any* by *all*). *Any* is equivalent to the *a* or *an* in many proverbial sayings; *e.g.* A woman's mind and winter's wind change oft, An honest miller has a golden thumb, An ill plea should be well pleaded. The force of *Any X* seems to be this:—A thing, and the only condition of acceptance is X-ness. Hence it follows that *Any* may be equivalent to *All*, and that from the statement

[1] In the above quotation I have substituted R and Q for S and P.

Any X is Y we may conclude that *All X's are Y*, *because* X-ness is connected with Y-ness. And conversely, from *All X's are Y*, it follows that *Any X is Y*, because from every X being Y there may be inferred a connection between X-ness and Y-ness.

PART II.

RELATIONS OF PROPOSITIONS.

SECTION VIII.

GENERAL REMARKS ON THE RELATIONS OF PROPOSITIONS.

PROPOSITIONS may be Compatible or Incompatible. Compatible Propositions are such as may be true together—*e.g.* M is P, S is M; Incompatible Propositions are such as cannot be true together—*e.g.* M is P, M is-not P.

Two Compatible Propositions may be (*a*) one-sidedly or (*b*) reciprocally inferrible; *e.g.* (*a*) Some R is Q is inferrible from All R is Q, one-sidedly; (*b*) Some R is Q, Some Q is R, are reciprocally inferrible from each other. (*a*) and (*b*) may be classed together as Correlative Propositions. Again, Compatible Propositions may be connected with each other not as Inference and Inferend, but as complementary Premisses—*e.g.* All N is R, All Q is N. Or they may be connected as Sub-contraries, of which both may be true, but not both can be false—*e.g.* Some R is Q, Some R is-not Q.

Two (Compatible) Propositions taken together may be related to a third (Compatible) as Premisses to Conclusion—*e.g.* M is P and S is M, therefore S is P. This Relation may be called Argumental.

An interesting case of relation of Propositions is the relation between a number of Propositions of the form

This is R,
That is R,
That other is R, etc.,

where a precisely similar Predicate is affirmed of a number of different Subjects, each of which refers to a distinct object. It is as the result of a number of perceptions that may be represented by such a set of Propositions, that objects distinct from one another, but similar in character, are grouped together as a kind of unity and indicated by a Class Name. Here, as in the case of Assertion and of Inference, there is a guiding idea of Unity in Difference; but in this case the Unity is a Unity between Attributes in different objects—*i.e.* Similarity in Otherness. A further case of relation is that between any Whole Categorical Proposition that is Distributive, and the several Singular Propositions into which it may be resolved. For instance, All R is Q is equivalent to

R^1 is Q,
and R^2 is Q,
and R^3 is Q, etc., etc.*

* *Cf.* Keynes, *Formal Logic*, 2nd ed., *n.* 2, p. 58.

If I can assert that All R is Q, I can assert that R^1, R^2, etc., are Q; if I can assert that R^1, R^2, etc., are Q, I can assert that All R is Q. The Categories which we use here are those of Identity in Diversity, of Similarity in Otherness, and of the Unity of Parts and Whole. The express inference is from Parts to Whole and from Whole to Parts; and the axiom of the inference is that what may be said of *each* member of a Class or Group may be said of the whole Class or Group distributively, and what may be said of a Class or Group distributively may be said of any member, or group of members, of that Class. Finally, from a number of Propositions, such as

All (or Some, or This, etc.)	R is B	B is Q
" " "	R is C	C is Q
" " "	R is D	D is Q
	etc.	etc.

we can conclude that R-ness may co-exist with B-ness, C-ness, D-ness, etc., and that B-ness, C-ness, D-ness, etc., co-exist with Q-ness, etc. The Relations considered in this paragraph may be grouped together as Classific.

All other Compatible Propositions (among Simple Categoricals)—*e.g.* S is P and Q is R, etc.—may be regarded as formally Unattached, that is, they carry *in themselves* no evidence whatever that either has any bearing on the other, no evidence that the affirmation or denial of one will justify the affirmation or denial of the other. That is, there is nothing to show that

there is Incompatibility or Subcontrariety or Unity between them. Unity may be a Unity of Identity in Diversity, of Similarity in Otherness, or of Parts and Whole. It is upon the perception of the first-mentioned kind of Unity, namely Identity in Diversity, that all Assertion and all Inference are based, and wherever we meet the words, *If, Therefore, Then, Because*, etc., indicating Inference, or the word *Or*, indicating Alternation, it will appear upon investigation (although the Propositions may not be obviously and explicitly connected) that there is this underlying identity. And wherever we find the words, *And, But, Too, Also*, etc., connecting Propositions (such Propositions being both compatible and dissimilar) the prominent connecting principle is that of the Unity of Parts and Whole. The Category of Parts and Whole is the Category of Division, Classification, and Systematisation generally. And in all Asserting, Inferring, Dividing, Classifying, and Systematising (and Classing also in as far as conscious and deliberate), there is some End or Purpose in view. Thus we find that Propositions connected by *And, Or, But, Therefore*, and the other conjunctions, are understood not only to have some bearing upon each other, but also to be collocated for some reason. Propositions *could* not reasonably be connected by conjunctions unless they really had some relation to each other; they *would* not be thus connected together by any rational being, unless there were some purpose to be served by doing so.

And signifies that the Propositions which it connects are to be taken together as reciprocally modifying each other, or at least that they have some common reference. Where there is no such reference the conjunction is felt to be inappropriate. *E.g.* it would sound absurd and unmeaning to say

> England is an island, and Sunday was a fine day,

or,

> Mr. Morley is a Radical, and this is one of Faber's pencils.

But implies that the Propositions which it connects modify one another in an unexpected, adverse, or limiting sense. *E.g.*—

> Jack will lend you his gun, but you must bring it back to-morrow; I shall be glad to see Fanny, but I hope she will not bring her cousin; Charlie has arrived, but he can only stay for ten minutes.

In *Or*, *If*, *Therefore*, *So*, *Because*, etc., there is, as already observed, reference to an underlying identity, as, for instance, we saw in the case of *If* when considering Inferential Propositions (*cf.* pp. 46, 47). Every one feels that such a combination of Categoricals as, *e.g.*—

> If Friday is the fifth day of the week, April is the fourth month of the year; If to-day is Sunday, there are 168 hours in a week,

and so on, are absurd, because there is no inferential connection discoverable between the elements that are

tacked together as Antecedent and Consequent. The mere introduction of a conjunction cannot, of course, confer relation upon essentially disconnected elements. If this could be done, there would be no reason why, *e.g.*, the insertion of the copula *is* should not introduce Identity between *S* and *not-S*.

TABLE VI.

RELATIONS OF PROPOSITIONS.

- *Incompatible Propositions.*
  E.g.—
  If E is F, K is H, / If K is not H, E is F.
  All R is Q, / No R is Q.
  All R is Q, / Some R is not Q.
- *Compatible Propositions.*
  - *Unattached P.*
    E.g. M is P, / Q is R.
  - *Attached P.*
    - (1) *Correlative P.*
      E.g.—
      All Q is R, / Some Q is R.
      Some R is Q, / Some Q is R.
    - (2) *Premissal P.*
      E.g.—
      M is P, / S is M.
    - (3) *Sub-contrary P.*
      E.g.—
      Some R is Q, / Some R is not Q.
    - (4) *Argumental P.*
      E.g.—
      M is P and S is M, / ∴ S is P.
    - (5) *Classific P.*
      E.g.—
      This is R, and that is R, etc. / (Class R.)
      R^1 is Q, and R^2 is Q, etc. / (= All R is Q.)
      All R is B, All R is C, All R is D, etc. / B is Q, C is Q, etc. / (∴ All R is BCDQ, Some B is RCQ, etc.)

SECTION IX.

INFERENCES IN GENERAL.

Any Proposition is an Inference from another or others when the assertion of the former is justified by the latter, while the latter is, in some respect, different from the former. *E.g.* (1) P is S is an Inference from (2) S is P; (3) S is P is an Inference from (4) M is P and S is M—because the assertion of (1) and (3) is justified by (2) and (4) respectively; (1) is true if (2) is true, and (3) is true if (4) is true.

If an Inference is from *one* Proposition to another, it is an Immediate Inference or Eduction; if an Inference is from *two* Propositions taken together to a third, it is a Mediate Inference or Argument.

Immediate Inferences (Eductions) may be either from any Proposition to another Proposition of the same form—that is, (1) from a Categorical to a Categorical, from an Inferential to an Inferential, or from an Alternative to an Alternative—*e.g.* from All R is Q to Some Q is R; or (2) from any Proposition to a Proposition of a different form—*e.g.* from Any animal that is horned is a ruminant, to If any animal be

horned it is a ruminant. These two kinds of Education might conveniently be called (1) Eversion, and (2) Transversion, respectively.

Mediate Inferences (or Arguments), whether Categorical, Inferential, or Alternative, may be either Relative or Absolute. All Absolute Arguments are formal—that is, they are invariably cogent, of absolutely general validity—and these Arguments may be classed together under the name of Syllogism. Relative Arguments—whether Categorical, Inferential, or Alternative—are not in a form that is necessarily and invariably cogent. In an Absolute Argument there may be Relative Propositions, but the argument does not depend at all upon the relativity of the propositions; whereas in Relative Arguments, the whole force of the inference does depend upon the relative character of its constituent propositions.

Relative Categorical Arguments are very common and very important (*cf.* Section IV., and *post*, pp. 129-132). Relative Inferential and Alternative Arguments—

E.g. If A is equal to B, C is equal to D
D is not equal to C
∴ B is not equal to A,
C is equal to D or A is not equal to B
But D is not equal to C
∴ B is not equal to A

—are possible and valid, but not commonly used; and they differ so little from the corresponding Absolute

Arguments, and are so easily reduced to them, that any separate consideration of them seems superfluous.

The term Deduction is frequently used as co-extensive with Mediate Inference or Argument, but it is perhaps even more commonly used as applying to all Mediate Inferences *except Inductions*; and this latter more restricted sense seems to me the more useful of the two. For if we are considering the relation between Premisses and Conclusion, the most striking and important difference of relation on which to found a Division of Categorical Mediate Inferences seems to be the difference between Premisses and Conclusion *in extent of application*—and we see that it is upon this difference that the current distinction between 'Deduction' and '[Imperfect] Induction' is based. For in the latter the Conclusion is really *wider* than one of the Premisses, while in all other Categorical Mediate Inferences the Conclusion is never wider than either Premiss, and is frequently narrower than *one* or than *both*.

Take, for instance, the following Arguments:—

(1) All N is Q
All R is N
All R is Q

(2) A is equal to B
B is equal to C
A is equal to C

(3) A is greater than B
B is greater than C

A is greater than C

(4) All N is Q
All R is N

$\left.\begin{array}{l}\text{One}\\ \text{Some}\\ \text{This}\\ \text{These}\\ \text{Etc.}\end{array}\right\}$ R is N

(5) All N is Q
$\left.\begin{array}{l}\text{One}\\ \text{Some}\\ \text{Etc.}\end{array}\right\}$ R is N

$\left.\begin{array}{l}\text{One}\\ \text{Some}\\ \text{Etc.}\end{array}\right\}$ R is Q

(6) All N is Q
This R is N

This R is Q

(7) Your N's are Q
These R's are your N's

These R's are Q

(8) $\left.\begin{array}{l}\text{These}\\ \text{(This)}\end{array}\right\}$ N's are Q
$\left.\begin{array}{l}\text{These}\\ \text{(This,}\end{array}\right\}$ R's are N

One (Some, etc.) R is Q

(9) That man is Robert Henderson
That man is my eldest brother

Robert Henderson is my eldest brother

(10) Dr. Lightfoot is Lady Margaret Professor
The Bishop designate of Durham is Dr. Lightfoot

The Bishop designate of Durham is Lady Margaret Professor

(11) Spring, Summer, Autumn, and Winter are four periods which are each three months long
Spring, Summer, Autumn, and Winter are the four seasons

The four seasons are four periods, which are each three months long

In all these cases, the Conclusion has no greater extent of application than either one of the Premisses. In (1), (2), (3), (7), (9), (10), (11), both Premisses and the Conclusion have the same extent; in (4) and (8), both Premisses have a similar extent of application, and the Conclusion in (4) is narrower, in (8) *may be* narrower; in (5), (6), one Premiss and the Conclusion have similar extent, and the other Premiss is wider.

We may illustrate these relations of extent by simple diagrams as follows:—

(*a*) Major Premiss

Minor Premiss

Conclusion

(*b*) Major Premiss

Minor Premiss

Conclusion

(*c*) Major Premiss

Minor Premiss

Conclusion

(1), (2), (3), (7), (9), (10), (11) might be represented by (*a*); (4) by (*b*); (8) by (*a*) or (*b*); (5) and (6) by (*c*).

In an Inductive Argument—*e.g.*

(12) Anything that has on one occasion been cause of Y /is/ always cause of Y
An X /is/ a thing that has on one occasion been cause of Y
———
An X /is/ always cause of Y
= Any X is cause of Y

—the relation of extent between the Premisses and the real Conclusion may be represented diagrammatically thus:—

(*d*) Major Premiss

Minor Premiss

Conclusion

Here the Major Premiss and Conclusion are of similar extent, while the Minor Premiss is narrower than

either. The Universal Conclusion from one Universal and one Particular Premiss is legitimate because of the peculiar form of the Major Term. It may be observed that Relative Categorical Arguments are generally of the type represented by the diagram (*a*).

We have already remarked that an Inference differs, *in some respect*, from the proposition or propositions that it is inferred from. *S is P* is not an Inference from *S is P*, but merely a repetition of it. And if we take (1) any Proposition (or Propositions) whatever, and (2) *any* Inference therefrom, the meaning of (2) and the impression conveyed by it are *not exactly* the same as the meaning of (1) and the impression conveyed thereby. Even the substitution of one synonym for another, or the substitution of a negative proposition for an equivalent affirmative, is not a *mere* change of words, but corresponds to *some* difference (however slight) in what the words express. There is, for instance, *some* difference in sense between All men are mortal, and No men are immortal, though these propositions are strictly equivalent. A Mediate Inference appears to differ from an Immediate Inference only in being more complex.

This seems a convenient place for inserting definitions of a few terms which will be frequently used in succeeding sections.

(1) *Equivalent.* Any two Categorematic words (or phrases) are equivalent when they have identical Application, and any two Syncate-

gorem tic words (or phrases) are equivalent when they have the same meaning. *E.g. London* and *the Metropolis of England* are Equivalent Terms; *also* and *likewise* are Equivalent Syncategorematic words. Any two different Propositions are equivalent which are reciprocally inferrible—*e.g. S is P* and *P is S* are Equivalent Propositions.

Hence Equivalent Words or Propositions may be substituted for one another.

(2) *Inference* (in narrow sense), the Proposition inferred to.

(3) *Inferend*, the Proposition or Propositions inferred from.

(4) *Inference* (in wider sense), (2) and (3) taken together.

(5) *To infer*, to pass from one or more Propositions (3), to another Proposition (2), (3) being the justification for (2), and (2) and (3) being in some respect different from one another.

(6) *Educt*, an Inference from one Proposition.

(7) *Educend*, the one Proposition inferred from.

(8) *Eduction*, (6) together with (7).

(9) *Educe*, to pass from (7) to (6).

(10) *Conclusion*, an Inference (1) from two (or more) Propositions taken together.

(11) *Premisses*, two Propositions from which a Conclusion is drawn.

TABLE VII

INFERENCES.

- *Immediate Inferences.* (Cf. Table VIII.)
- *Mediate Inferences.* (Arguments.)
  - *Syllogisms* (*Absolute Arguments*).
    - *Categorical.*
      - *Deductions.*
        - *E.g.* (1) All matter gravitates; Comets are matter; ∴ Comets gravitate.
        - (2) London is the metropolis of England; London is the largest city in the world; ∴ The largest city in the world is the metropolis of England.
        - (3) Sunday, Monday, etc. are seven periods which are each 24 hours long; Sunday, Monday, etc. are all the days of the week; ∴ All the days of the week are seven periods which are each 24 hours long.
      - *Inductions.*
        - *E.g.* What has once been cause of Y will be always cause of Y; X has once been cause of Y; ∴ X will be always cause of Y (= All X is cause of Y).
    - *Inferential.* (Cf. Table IX.)
    - *Alternative.* (Cf. Table X.)
  - *Relative Arguments.*
    - *Categorical.* *E.g.* A = B. B = C. ∴ A = C.
    - *Inferential.* (Cf. p. 80.)
    - *Alternative.* (Cf. p. 80.)

SECTION X.

IMMEDIATE INFERENCES (EDUCTIONS).[1]

WHEN we pass from *one* Proposition to another, and the latter is justified by the former and differs from it in some respect, the latter is an Immediate Inference, or Eduction, from the former.

Eductions may have (I.) Categoricals (*a*), or Inferentials (*b*), or Alternatives (*c*), for both Educt and Educend; these Pure Eductions may be called Eversions. Or (II.) they may have a Categorical with an Inferential (*a*), or a Categorical with an Alternative (*b*), or an Inferential with an Alternative (*c*). These Mixed Eductions may be called Transversions.

The fundamental kinds of formal Eduction are Conversion, Obversion, Subversion (including Subalternation), and Extraversion. All other kinds are a combination of some of these. *E.g.* Contraversion [Contraposition], Retroversion, and Inversion are a combination of Conversion and Obversion.

[1] I have ventured in this Section to suggest and use several new terms (including *Contraversion* as a substitute for *Contraposition*), thus—as I hope—making the whole terminology of Immediate Inference more complete, uniform, and expressive.

I.—(*a*) CATEGORICAL EVERSIONS.

CONVERSIONS.

The principle of Conversion is, that the Terms (or elements) of Propositions may be transposed (the possibility of this as regards Categoricals is a direct consequence of the identity of application of S and P). Thus, in Categoricals the Subject-Term of the Convertend becomes the Predicate of the Converse, and the Predicate-Term of the Convertend becomes the Subject-Term of the Converse—*e.g.* *S is P* converts to *P is S*, *S is-not P* converts to *P is-not S*. Where the Subject-Term is an unquantified Name or Symbol, there is generally no doubt as to what is the proper converse, and no minor rules are needed, in order to guard against fallacy.

E.g. R is Q, Tully is Cicero, Courage is Valour, *Marguerite* is the French for *Daisy*, Generosity is not Justice, Lord Hartington is not the present Prime Minister, London is the largest city in the world, Genius is Patience, are converted by simple transposition of S and P.

But in dealing with Class Propositions that have a quantified Subject and an unquantified Predicate, mistake becomes more likely; because in Conversion the unexpressed but *implied* Term-Indicator of the old Predicate-Name has to be expressed, since that Name is now the Subject-Term; and on the other hand the *expressed* Term-Indicator of the old Subject-

Name becomes unexpressed and merely implied, that Name being the new Predicate-Name. And a further possible source of mistake is this, that when a Class-name occurs as Term without an Indicator, a different Indicator is understood when it is a Subject-Term from what is understood when it is a Predicate-Term. For instance, in Trees are plants, *Trees* would be understood to have *All* as implied Term-Indicator; in Oaks are Trees, *Trees* would be understood to have *Some* as implied Term-Indicator. And if we converted this last Proposition, it would be to *Some* Trees are Oaks. If we convert any A Proposition—All R's are Q's—we pass to an I Proposition—Some Q's are R's; similarly in converting E and I (No R is Q, Some R is Q), we *add* a Term-Indicator to the new Subject-name (Q) and drop the previously expressed Indicator of the new Predicate-name (R). As this point has already been discussed in the section on Quantification, it will be sufficient here to give a table of the Converses of Class Propositions.

A.	All R is Q converts to	Some Q is R (I).
E.	No R is Q ,,	No Q is R (E).
I.	Some R is Q ,,	Some Q is R (I).
O.	Some R is-not Q is inconvertible. (*Cf.* pp. 65, 66.)	

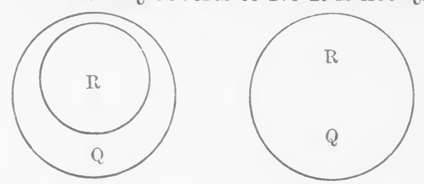
(*Cf.* diagrammatic illustration of the possible relations between any two Classes, p. 25. For the sake of distinction the Converse of E and I may be called the Reverse, the Converse of A the Intraverse.)

OBVERSIONS.

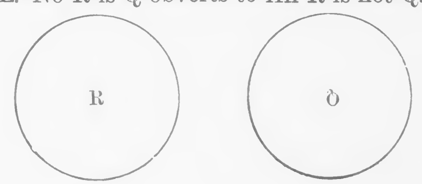
The principle of Obverting is that Any assertion justifies the denial of its negative (*cf.* Law of Contradiction). To take instances:—

The assertion of *S is P* justifies me in denying *S is not-P*—that is, from *S is P* I can proceed to *S is-not not-P* (the denial of *S is not P*, which is the negative of *S is P*); from *Juno /is-not/ Minerva* I can proceed to *Juno /is/ not-Minerva*. From *All is fine that is fit*, I can pass to *Nothing is not fine that is fit.* Here, again, the only likelihood of difficulty in connection with Categoricals arises when we are dealing with Class Propositions; but the possible difficulty in this case is extremely slight, and it is sufficient to give the laws of Obverting Categoricals and the forms of Obversions in the case of A, E, I, O.

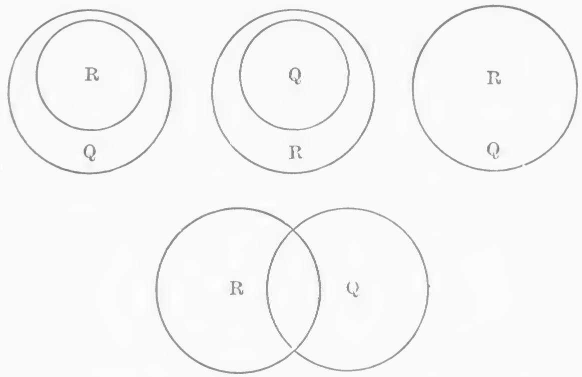
A. All R is Q obverts to No R is not-Q.



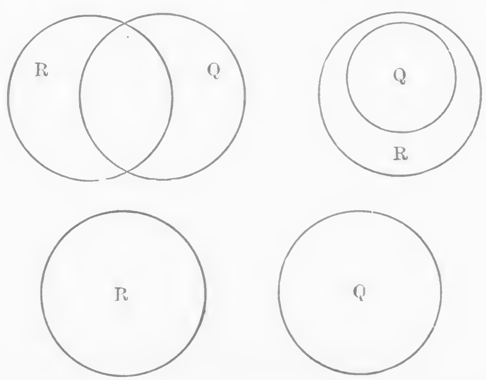
E. No R is Q obverts to All R is not-Q.



I. Some R is Q obverts to Some R is-not not-Q.



O. Some R is-not Q obverts to Some R is not-Q.



The laws for obverting Categoricals are:—

(1.) S-name of Obvertend is S-name of Obverse.

(2.) The negative of the P of Obvertend is the P of Obverse.

(3.) Obverse and Obvertend differ in Quality.

(4.) Obverse and Obvertend have the same Quantity.

Obversion will not apply when = is regarded as the Copula.

SUBVERSIONS.

In Subverting Categoricals, the passage is from a given Proposition to another which has the same Quality and a Subject of either narrower Application or more indeterminate Signification; or a more indeterminate Predicate. *E.g.*

(1) All triangles are trilaterals;
∴ All isosceles triangles are trilaterals.

(2) Some white violets are fragrant;
∴ Some violets are fragrant.

(3) Topsy is an African negro;
∴ Topsy is a negro.

The only kinds of Subversion which are of absolutely general validity[1] are (2) and what is called Subalternation—that is, Inference from a Whole Proposition, an A or E, to a Particular. *E.g.*

Every wind is ill to a broken ship,

subverts (by Subalternation) to

Some winds are ill to a broken ship.

We may regard the *Dictum de omni et nullo* (*cf.* note, p. 123) as supplying a Canon of Subalternation.

[1] *Cf. post*, note, p. 96.

EXTRAVERSIONS (*e.g.* Inferences by 'Complex Conception' and by 'Added Determinants') are such as, A is B, therefore AX is BX; C is D, therefore C+2 is D+2, etc.; and are a kind of Eduction with which we are all familiar. The principle of Extraversion is, that if any qualification or determination (positive or negative) is attached to a name or symbol, *the same* qualification or determination may be attached to its equivalent—but when significant words are used their force becomes so variously and subtilely altered by their context, that in inferences of this kind (constant and indispensable as they are) there is a liability to fallacy which can only be guarded against by reference to the special circumstances of each case.

If, *e.g.*, we inferred that, because a carpenter is a man, therefore a good carpenter is a good man, the inference would be clearly unjustifiable: and for this reason, that the added determination 'good' is not understood in the same sense when it qualifies *man* as when it qualifies *carpenter*. Or if we argue that because an acorn will grow into an oak, therefore an acorn and a half will grow into an oak and a half, the inference is ridiculous, while on the other hand we can infer that if one acorn will grow into one oak, two acorns will grow into two oaks.[1] Immediate Inferences of the form Some XR is Q, therefore Some X is Q and Some R is Q (*cf.* Hillebrand, *Die neuen Theorien der kategorischen Schlüsse*, p. 69) are, as already observed, most appropriately classed with Subversions.

[1] The Contraverse (Contrapositive) of the Contraverse of any Proposition may be regarded as an Extraverse—*e.g.* from (1) Lord Salisbury is the present Prime Minister of England, we can infer (2) Not-Lord Salisbury is not-the present Prime Minister of England; (2) being the Contraverse of the Contraverse of (1), and being also an Extraverse. (It must be remembered, however, that we cannot have an unquantificated Contraverse of an I Proposition, nor can we obvert when any Copula except *is* (*is not, are, are not*) is admitted.)

De Morgan remarks somewhere that 'All the logic in the world will not enable me to prove that because a horse is an animal, therefore the head of a horse is the head of an animal.' This is an Extraversion (Inference by Complex Conception), and Logic can prove it just as much, or as little, as it can prove that Because S is P, therefore P is S. In each of these two cases it is self-evident that the Proposition *inferred to* is true if the Proposition *inferred from* is true. This 'proof' is of a kind that we cannot go beyond, and do not need to go beyond.

Extraversion is used to an enormous extent in mathematical reasoning, and here it can always be depended upon, because units of quantity are not intrinsically altered by being put together or taken apart. Thus, if

$$2+5=7$$

then

$$2+5-1=7-1,$$

$$\frac{2+5-1}{2}=\frac{7-1}{2}, \quad \text{etc.};$$

and, more generally, whatever quantities or numbers a, b, c, d, and x, stand for, if

$$a+b=c+d$$

then

$$\frac{a+b}{x}=\frac{c+d}{x},$$

and so on. Extraversion may be defined as a kind of Eduction in which, from the modification of one of two Terms which have identical application, we infer a precisely similar modification of the other Term.[1]

CONTRAPOSITIONS or CONTRAVERSIONS.

In a Contraverse the old Subject-name is predicated of the negative of the old Predicate-name, and the Quality of a Contraverse differs from that of the Contravertend.

[1] While, on the one hand, Extraversion is applicable without limit in the case of, *e.g.*, Mathematical Propositions, but not in the case of ordinary Absolute Propositions (*cf. ante*, pp. 93-95); on the other hand, Subversion of the form R is Q .·. RX is Q, which is applicable without limit in the case of ordinary Absolute Propositions, is entirely inapplicable in the case of Mathematical Propositions. For instance, let

$$R=2+2$$
$$Q=4$$
$$X=-1$$

then clearly

R is Q .·. RX is Q

is quite illegitimate. It is obvious that any numerical modification of any number R reduces it to not-R; whereas the utmost effect of adding a determination, X, to any non-numerical class-name, R, is simply to substitute for the *genus* R the *species* XR.

The Contraverse of any Categorical Proposition is obtained by first obverting that Proposition, and then converting the obverse. *E.g.* IF is STIFF contraverts to NOT-STIFF is-not IF.

There is no Contraverse of I, because its Obverse is an O proposition (which cannot be converted).

RETROVERSIONS.

The corresponding process of first converting and then obverting may be called the Retroverse. *E.g.*

Some true doctrines are universally accepted

retroverts to

Some things universally accepted are not untrue doctrines.

In a Retroverse the negative of the old Subject-name is predicated of the old Predicate-name, and the Quality of the Retroverse differs from that of the Retrovertend.

There is no Retroverse of O.

INVERSIONS.

In a Categorical Inversion 'we obtain from a given proposition a new proposition, having the contradictory of the original subject [name] for its subject [name], and the original predicate for its predicate' (Keynes, *Formal Logic*, second edition, p. 107). Also the Inverse of any Categorical Proposition differs from the Invertend in both Quantity and Quality. A and E are the only Categoricals which can be inverted. The following are examples:—

No sunshine is without shadow

inverts to

Some things that are not-sunshine are without shadow.

A friend in need is a friend indeed

inverts to

Some who are not-friends in need are-not friends indeed.

Only Coincidental Categoricals can be converted, contraverted, retroverted, or inverted. Adjectivals as well as Coincidentals may be subverted, obverted, and extraverted.

TRANSFORMATIONS.

In addition to the above, there is a kind of Immediate Inference that can be drawn from Relative Propositions only, and may be called Transformation. In Categorical Transformations we pass from one Proposition to another which is an inference from it, but in which both the Terms are new, owing to the fact that in the Inferend, the Subject-Term applies to *one* of two related objects, while in the Inference, the Subject-Term applies to the *other* of those two objects. Such inferences can be drawn from a Relative Proposition, without further information, by any one who knows the System referred to by the Proposition. *E.g.* let X and Y be two solid bodies, bearing a certain relation to one another which may be expressed in the Proposition

X /is/ larger than Y—

from this, if we understand the relations of magnitude in space, we may, without any further knowledge about X and Y, conclude that

Y /is/ smaller than X.

Again, from

If A = B, C = D

we can infer

If B = A, D = C.

The principle of Transformations may be stated as follows:—

If, of one object, relation to a second object is predicated: then of that second object its implied relation to the first object may be predicated.

The above kinds of Eduction may be applied to Inferential and Alternative Propositions. The following are examples:—

I.—(*b*) INFERENTIAL EVERSIONS.

CONVERSIONS.

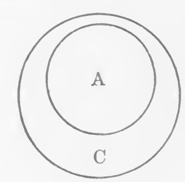
If A, C

If any E is F, that E is H

convert to

If C, A may be

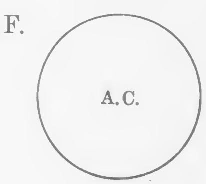
If any E is H, that E may be F.



If X is Y, X is Z

converts to

If X is Z, X may be Y.



If any flower is scarlet, it is scentless

converts to

If any flower is scentless, it may be scarlet.

If life is worth living, Honesty is the best policy

converts to

If Honesty is the best policy, life may be worth living.

OBVERSIONS.

If A, C

If any E is F, that E is H

obvert to

If A, not not-C

If any E is F, that E is not not-H.

(*Cf.* Any EF is H, ∴ (by Obversion) Any EF is-not not-H.)

If X is Y, X is Z

obverts to

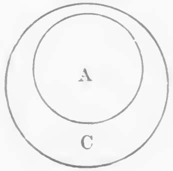
If X is Y, X is not not-Z.

If you would know a knave, give him a staff

obverts to

If you would know a knave, don't omit to give him a staff.

SUBVERSIONS.



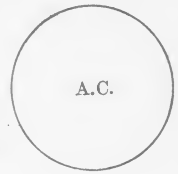
If A, C

If any E is F, that E is H

subvert to, *e.g.*,

If A, C may be

If any E is FK, that E is H.



If X is Y, X is ZM

may subvert to

If X is Y, X is Z.

If Charles I. had not deserted Strafford, he would be more deserving of sympathy

may subvert to

If Charles I. had not deserted Strafford, he might be more deserving of sympathy.

If any violet were scarlet, that violet would be scentless

subverts to, *e.g.*,

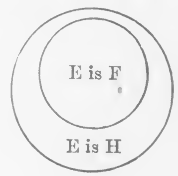
If any violet were bright scarlet, that violet would be scentless.

EXTRAVERSIONS.

If A is greater than B, then B is less than A

extraverts to, *e.g.*,

If A is three times greater than B, then B is three times less than A.

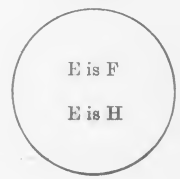


If X is Y, X is Z

extraverts to, *e.g.*,

If X is QY, X is QZ.

CONTRAVERSIONS.



If A, C

If E is F, E is H

contravert to

If not C, not A

If E is not H, E is not F.

If money goes before, all ways lie open

contraverts to

If some ways are not lying open, money does not go before.

RETROVERSIONS.

If A, C
If E is F, E is H,

retrovert to

If C, not not-A may be
If E is H, E may be not not-F.

If he is quiet, he is in mischief

retroverts to

If he is in mischief, he may be not making a noise.

INVERSIONS.

If A, C
If E is F, E is H

invert to

If not A, C may be not
If E be not F, E may be not H.

If all men are liable to mistakes, all men should be modest

inverts to

If some men are not liable to mistakes, some men need not be modest.

TRANSFORMATIONS.

If A is equal to B, C is equal to D

transforms to, *e.g.*,

If B is equal to A, D is equal to C.

I.—(*c*) ALTERNATIVE EVERSIONS.

CONVERSIONS.

Either C or not-A Either E is H or E is not F	Either Honesty is the best policy, or Life is not worth living.

convert to

A may be, or C is not Either E may be F or E is not H.	Either Life may be worth living or Honesty is not the best policy.

OBVERSIONS.

Either C or not A Either E is H or E is not F,	Either the roads are wet or rain has not fallen.

obvert to

Either not not-C or not A Either E is not not-H or E is not F.	Either the roads are not dry or rain has not fallen.

SUBVERSIONS.

Either C or not A, Either E is KH or E is not F,	Either a violet is a scentless abnormity, or it is not scarlet,

may subvert to

Either C may be or A is not Either E is H or E is not F.	Either a violet is an abnormity, or it is not scarlet.

EXTRAVERSIONS.

Either E is H or E is not F,	Either a speaker must be convinced or he is not convincing,

extravert to, *e.g.*,

Either DE is H or DE is not F.	Either a speaker must be intensely convinced, or that speaker is not intensely convincing.

CONTRAVERSIONS.

Either C or not A Either E is H or E is not F,	Either the streets are wet, or rain has not fallen,

contravert to

Either not A or C; Either E is not F, or E is H (or not not-H).	Either rain has not fallen, or the streets are not dry.

RETROVERSIONS.

Either E is H or E is not F,	Either the streets are wet, or rain has not fallen,

retrovert to

Either E may be not not-F or E is not H.	Either the streets are dry or rain may have fallen.

INVERSIONS.

Either E is H or E is not F,	Either violets are fragrant, or they are not white,

invert to

Either E may be not or E may be not not-F.	Either violets may be not fragrant or they may be white.

TRANSFORMATIONS.

A is equal to B or E is equal to F

transforms to, *e.g.*,

B is equal to A, or F is equal to E.

II. TRANSVERSIONS.

Since the elements of Hypotheticals, and of the Alternatives which correspond to them, are Categoricals, and Conditionals (with the corresponding Alternatives) are expressible in only such Categoricals as

have complex Subject or Predicate, or both, it is clear that a simple Categorical is not reducible to Inferential or Alternative form.

E.g. I am sorry, London is a metropolis, This man is an artist, Genius is Patience, To err is human, are not susceptible of a simple and natural expression as Inferentials or Alternatives. On the other hand, all Inferentials and Alternatives may, if desired, be expressed as Relative Categoricals.

If A, C (1)

is equivalent to

C /is/ an inference from A.

Either C or not-A (2)

is equivalent to

C /is/ alternative with not-A,

and (1) and (2) are equivalent.

Conditionals reduce to Absolute Categoricals ot the form

Any D that is E is F.

Any D is F or not E (1)

is equivalent to

Any D that is E is F,

and to

If any D is E, it is F (2)

(2) may be reduced to the Relative Categorical

That any D is F, is an inference from its being an E;

and (1) may be reduced to

That any D is not E is alternative with its being an F.

TABLE VIII.

IMMEDIATE INFERENCES (EDUCTIONS).

- *Pure Eductions* (*Eversions*).
  - *Categorical Eversions.*
    - *Subversions* (*including Subalternations*). *E.g.*— All R is Q ∴ XR is Q. Some XR is Q ∴ Some R is Q. A is BC ∴ A is B.
    - *Obversions.* *E.g.*— Some R is-not Q ∴ Some R is not-Q.
    - *Conversions.*
      - *Reversions.* *E.g.*— No S is P ∴ No P is S.
      - *Intraversions.* *E.g.*— All R is Q ∴ Some Q is R.
    - *Contraversions,* or *Contrapositions.* *E.g.*— No R is Q ∴ Some not-Q is R.
    - *Retroversions.* *E.g.*— No R is Q ∴ All Q is not-R.
    - *Inversions.* *E.g.*— No R is Q ∴ Some not-R is Q.
    - *Extraversions.* *E.g.*— All R is Q ∴ All XR is XQ.
    - *Transformations.* *E.g.*— A is equal to B ∴ B is equal to A.
  - *Inferential Eversions.* (*Cf.* Section x.)
  - *Alternative Eversions.* (*Cf.* Section x.)
- *Mixed Eductions* (*Transversions*).
  - *Categorico-Inferential T.* *E.g.*— Any D that is E is F ∴ If any D is E, that D is F. If E is F, G is H ∴ G is H in an inference from E is F.
  - *Categorico-Alternative T.* *E.g.*— Any D that is E, is F ∴ Any D is F or not E.
  - *Inferentio-Alternative T.* *E.g.*— If E is F, G is H ∴ G is H or E is not F.

SECTION XI.

INCOMPATIBLE PROPOSITIONS.

PROPOSITIONS are Incompatible when they cannot both be true; and while of Propositions related as Educt and Educend, the first is true if the second is true, of Propositions related as Incompatibles, either is false if the other is true.

Propositions are generally said to be Contrary when they cannot both be true but may both be false—*e.g.* All R is Q, No R is Q; Contradictory when they cannot both be true and cannot both be false—*e.g.* All R is Q, Some R is not Q. With Simple Categoricals, it is only where we are concerned with Propositions that have quantified Subjects that Propositions can be contrarily opposed. All R is Q, and No R is Q seem to be the only Categorical Contraries ordinarily recognised. We do, of course, have Incompatibility between such Propositions as

These R's are Q (1)
Some of these R's are not Q (3)
These R's are not Q (2)
One of these R's is Q (4);

but the relation between (1) and (2), (1) and (3), (2) and (4) respectively, exactly corresponds to that between A and E, A and O, E and I. For *These R's*, as contrasted with *Some of these R's*, is equivalent to *All these R's.* The possibility of the two kinds of denial (Contrary and Contradictory) depends upon the fact, previously observed, that the Proposition, *All R is Q*, *All these R's are Q*, etc., are abbreviated expressions for the sum of a number of Singular Propositions—

R^1 is Q
R^2 is Q
R^3 is Q, etc.

A Proposition which sums up these can of course be denied either by denial of the whole series, or by denial of any one (or more) of its constituents.

In all other cases a simple Categorical has but one formal Categorical Incompatible, and that one is its Contradictory—

E.g. $\begin{cases}\text{S is P}\\ \text{S is not P}\end{cases}$

$\begin{cases}\text{Charles I. was a saint}\\ \text{Charles I. was not a saint.}\end{cases}$

In such a Proposition as

Billy and Colin are at school

we have what Jevons calls a Compound Proposition, which is really an abbreviated expression of a plurality of simple Propositions. And here, as in the case of A and E, we may have two Categorical Incompatibles—but here both of them are Contrary—*e.g.*

Both Billy and Colin are not at school (1)

Only one of the two is at school. (2)

The Contradictory is obtained by a combination of (1) and (2)—

It must be true that

Billy and Colin are at school,

or that

One only is at school or neither is.

Billy is at school and in the first class,

may be treated in the same way.

The Conditional Proposition

If any D is E, that D is F (1)

is certainly incompatible with

If any D is E, that D is not F (2).

But if the import of (1) can be expressed by saying

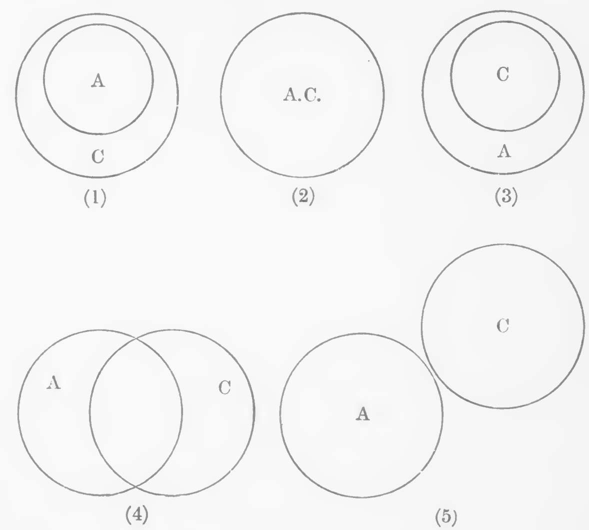
That any D is F *is an inference from* its being an E,

then (1) and (2) do not exhaust all possibilities; for it may be that neither *D is F* nor *D is not F* is an inference from D's being E; it may be that no connection is known between *D's being E* and *D's being F.* (*Cf.* If any dog is brown, that dog is a spaniel.) No doubt between *any* two identities there must be some connection; but (*a*) the connection may not be such as to warrant our making any inference from the one to the other; and (*b*) we may not know what the connection is.

We may exhibit Contradictories of Class Categori-

cals, of Inferentials, and of Alternatives with the help of diagrams as follows:—

Let (1) (2) (3) (4) (5) represent the possible relations between A and C (A and C being, in the case of Categoricals, *Class Names*, of which we are considering the relative extent of application; in the case of Inferentials and Alternatives being *Propositions*, in regard to which we are considering the relations of inferential and alternative dependence.)



Then

All A is C (1) (2) } is contradicted by { Some A is not C (3) (4) (5).

No A is C (5)	is contradicted by	Some A is C (1) (2) (3) (4).
Some A is C (1) (2) (3) (4)	,,	No A is C (5)
Some A is not C (3) (4) (5)	,,	All A is C (1) (2).

(1) or (2) are contraried by (3) or (4) or (5)
(5) is ,, ,, (1) or (2) or (3) or (4).

If A, C (=If not C not A) (1) (2)	is contradicted by	If A, C may be not (=If not C, A may be) (3) (4) (5).
If there is a gloomy sunset to-night, to-morrow will be wet.	,,	Though we may have a gloomy sunset to-night, it does not follow that to-morrow will be wet.
If your dog is brown, he is a spaniel.	,,	Though my dog is brown, it does not follow that he is a spaniel.
If A, C may be (=If C, A may be) (1) (2) (3) (4)	,,	If A, not-C (=If C, not A) (5).
If money go before, some ways lie open	,,	Though money go before, no ways lie open.
Either C or not-A (=Either not-A or C) (1) (2)	,,	Either not-A, or [if A] C may be not ; Neither C nor not-A (3) (4) (5).
Either the flower in question is scarlet, or it is not a geranium.	,,	The flower in question may be not scarlet though a geranium ; the alternative to the flower's being scarlet need not be that it is not a geranium ; the flower may be neither scarlet nor not a geranium.

Either A or not-C (2) (3).	is contradicted by	Either C is not, or not-A is possible ; Neither A nor not-C (1) (4) (5).
He must submit or he will be ruined.	,,	His submission and his ruin are not alternatives.
It is either knavery or folly.	,,	It may be neither knavery nor folly.
He has not done it, or he deserves to go to prison.	,,	He may have done it and yet not deserve to go to prison.
Either A may be or C is not (=Either C may be or A is not) (1) (2) (3) (4).	,,	Neither C is not nor may A be (=Neither is A not, nor may C be); Either not-C or not-A (5).

SECTION XII.

CATEGORICAL MEDIATE INFERENCES.

In Mediate Inferences or Arguments, the Inference is drawn from two Propositions taken together, which are called the Premisses. In Categorical Mediate Inferences the Conclusion and both Premisses are Categorical Propositions. Categorical Mediate Inferences may be divided into Absolute Arguments or Syllogisms, and Relative Arguments.

A Categorical Argument may be defined as—

> A combination of three Categorical Propositions, one of which (the Conclusion) is inferred from the other two taken together—these two being called the Premisses.

> A Categorical Syllogism is a Categorical Argument, of which the Premisses have in common one Term-name which does not occur in the Conclusion. The Conclusion has its S-name in common with one Premiss, and its P-name in common with the other Premiss.

A Syllogism as thus defined may have *five* Terms, but can have only *three* Term-names (*cf.* p. 10).

E.g. in

(*a*) All N is Q
(*b*) All R is N
(*c*) Some R is Q

the *Terms* are (1) All N, (2) [Some] N, (3) All R, (4) Some R, (5) [Some] Q; the *Term-names* are (1) R, (2) N, and (3) Q. In the above Syllogism, All N and [Some] N are Middle Terms, All R and Some R are Minor Terms, and [Some] Q is Major Term. [Some] N of course coincides, *ex vi termini* with part (at least) of All N, and it is this part of All N that is the real medium of connection between Major and Minor Terms.

The Middle Term, then, in either Premiss of a Syllogism, is that which has the Term-name common to both Premisses.

The Major Term in the Premisses of a Syllogism is that which has its Term-name in common with the P of the Conclusion; and the Major Premiss is the Premiss which contains the Major Term.

The Minor Term in the Premisses of a Syllogism is that which has its Term-name in common with the S of the Conclusion; and the Minor Premiss is the Premiss which contains the Minor Term.

In the Syllogism given above, (*a*) is the Major Premiss, (*b*) is the Minor Premiss, and (*c*) is the Conclusion.

The CANON OF CATEGORICAL SYLLOGISMS (as thus defined) may be stated as follows:—

If the Application of any two Terms is identical (or distinct), any third Term which has a different Term-name, and is identical in Application with the whole (or part) of one of those two, is also (in whole or part) identical with the other (or distinct from it).

To take examples of the most generalised form of Categorical Syllogism—in

M is P
S is M
———
S is P

the two Terms M and P have identical application; a third Term, S, is identical in Application with M; therefore S is identical with P.

In

M is-not P
S is M
———
S is-not P

the two Terms M and P have distinct Application—what M applies to is *other than* (not identical with) what P applies to; but a third Term, S, is identical in Application with M, therefore it is distinct from that which M is distinct from, namely P.

In the case of Categorical Class Syllogisms, the application of the Canon may be illustrated by taking

the following examples expressed in symbols. In

(No N) is (Q)
(All R) is (N)
———
(No R) is (Q)

the Application of (1) All N is other than the Application of (2) [All] Q; and the Application of (3) All R is identical with some of the Application of All N; hence All R is other than [All] Q.

In

(All Q) is (N)
(No R) is (N)
———
(No R) is (Q)

the Application of (1) All R, is different from that of (2) [All] N; the Application of (3) All Q, is identical with some of the Application of [All] N; hence the Application of All R is other than the Application of [All] Q.

In

(All N) is (Q)
(All N) is (R)
———
(Some R) is (Q)

the Application of (1) All N is identical in Application with (2) [Some] Q; the Application of (3) [Some] R is identical with the application of All N; hence the Application of Some R is identical with the Application of [Some] Q.

The following Rules secure the applicability of the Canon, and the exclusion of all invalid Syllogisms:—

Rule I.—In every Syllogism, the Application of the Middle Term in one Premiss must be identical with the whole, or a part, of the Application of the Middle Term in the other Premiss.[1]

Rule II.—The Application of the Major Term and the Minor Term in the Conclusion must be identical with the whole, or a part, of the Application of the Major and Minor Terms respectively in the Premisses.[2]

Rule III.—Identity of Application of the Terms in the Conclusion requires Identity of Application in both Premisses; and Otherness of Application of the Terms in the Conclusion requires Otherness of Application of the Terms in one (but only one) Premiss.

From any pair of Premisses in which there is a breach of Rule I., no Mediate Inference can be drawn; since any breach of Rule I. involves the absence of a true Middle-Term—that is, it involves the absence of complete or partial coincidence of Application between one Term (and one Term only) in one Premiss, and one

[1] By Obversion of either Premiss, which has the Middle Term for Predicate, these corresponding Terms in the two Premisses may be made absolutely distinct. *E.g.*—

All Q is N (1)
No R is N (2)

by Obversion of (2) becomes

All Q is N
All R is not-N.

[2] By Obversion of the Conclusion, the Application of the Major Term in the Conclusion may be made absolutely distinct from the Application of the corresponding Term in the Premisses; and by Obversion of the Minor Premiss (when the Minor Term is Predicate in its Premiss), the Minor Term in the Conclusion is made the negative of the Minor Term in the Premisses.

Term in the other Premiss (without which there is no such connection between the Premisses as makes it possible to draw a conclusion from them taken together). Where there is a breach of Rule II., or of Rule III., the Conclusion is not that which ought to be inferred from the Premisses taken together; and there is (*a*) Illicit Process of the Major Term, or (*b*) Illicit Process of the Minor Term, or (*c*) more than three Term-names in the Premisses, together with the Conclusion (and in all these cases there is a redundancy of Terms in Premisses + Conclusion); or finally, (*d*) *one* Premiss is repeated or inferred from (and in this case there is the fault of Tautology).

The following pairs of Propositions illustrate breaches of Rule I.—from none of them can *any* Mediate Inference be drawn as Conclusion:—

All R is Q	K is L	Some N is Q
Some R is Q	T is V	Some N is R

All angels are good spirits
All angels are coins worth ten shillings.

The following Syllogisms illustrate breaches (*a*), (*b*), (*c*), (*d*) of Rules II. and III.:—

(*a*)	All N is Q Some R is N All R is Q.	(*b*)	All N is Q No R is N No R is Q.
(*c*)	All N is Q All R is N All X is Q.	(*d*)	These statesmen are authors These statesmen are musicians Some musicians are statesmen.

In Deductions in which all the Subject-Terms are Individual or Partial, and have the same extent of Application, and in all quantificated Categorical Syllogisms, it is not of essential consequence which Premiss is Major or Minor, nor which Term is S and which P, in any of the three constituent Propositions. But in dealing with unquantificated Class Categoricals, both these points are of essential importance, since transposition of Terms or Propositions may be impossible, or may destroy the validity of a Syllogism. *E.g.* in

> London is the capital of England
> London is the largest city in the world
> ---
> The capital of England is the largest city in the world,

we may alter the order of Terms and of Propositions without destroying the validity of the Syllogism, or essentially affecting the meaning conveyed by it.

And of such a Syllogism as

> The 'Syndics' and 'Night Watch' are some of Rembrandt's masterpieces
> The 'Syndics' and 'Night Watch' are two of the pictures in the new *Museum* at Amsterdam
> ---
> Two of the pictures in the new *Museum* are some of Rembrandt's masterpieces,

we may say the same. But if we take a Class Syllogism such as the following—

> All Planets are heavenly bodies (1)
> No Planets are self-luminous (2)
> ---
> Some heavenly bodies are not self-luminous (3),

and put (2) for Major Premiss and (1) for Minor Premiss, this necessitates conversion of (3)—since the P of the Conclusion must be the Major Term, and the S of the Conclusion must be the Minor Term—but (3) being an O Proposition, is inconvertible.

And if we take as the Premisses of an AAA Syllogism the following two propositions—

> All Carnivora are fierce (1)
> All Lions are Carnivora (2)

we find that with (1) for Major Premiss and (2) for Minor Premiss we get a valid Conclusion in A, *i.e.*—

> All Lions are fierce.

But with (2) for Major Premiss and (1) for Minor Premiss, our Conclusion, if A, must be—

> All fierce creatures are Lions,

which is invalid; and if the Conclusion is I, *i.e.*—

> Some fierce creatures are Lions—

the Syllogism is valid, but it is not AAA (in Fig. I.) but AAI (in Fig. IV.).

Hence it is necessary to consider the different *Figures* and *Moods* of Class Syllogisms, and in connection with them, the Reduction of one Syllogistic Mood to another.

By *Mood* is meant the *form* and *order* of the Pro-

positions which go to make up a Syllogism—thus the Mood EAE (*e.g.* cEsArE) refers to a Syllogism consisting of an E Major and Conclusion, and an A Minor.

By *Figure* is meant the order of Terms in the Premisses of a Syllogism. Since this may vary in four ways, there are four figures of Syllogism, called respectively the First, Second, Third, and Fourth Figures, as follows:—

Fig. I.	Fig. II.	Fig. III.	Fig. IV.
M-P	P-M	M-P	P-M
S-M	S-M	M-S	M-S

Of Class Syllogisms only AAA (AAI), EAE (EAI), AII, and EIO are valid Moods in Fig. I.; only EAE (EAO), AEE (AEO), EIO, AOO, in Fig. II.; only AAI, IAI, AII, EAO, in Fig. III.; and only AAI, AEE (AEO), IAI, EAO, EIO, in Fig. IV.

In Fig. I. and Fig. III. the Major Premiss and the Conclusion may be Adjectival Propositions (*cf. ante*, pp. 14, 15), but the Minor Premiss cannot; and in Fig. II. and Fig. IV. neither of the Premisses, nor the Conclusion, can be Adjectival.

An ancient verse of logical Mnemonics contains the technical names of nineteen of these 'Moods' (the five Moods in brackets being weakened forms of the Syllogisms which they follow—that is, having a Particular Conclusion when the corresponding Universal is justified by the Premisses). The verse furnishes at the same time a key by which the unweakened Moods of Figs. II., III., and IV. may be reduced to unweakened Moods of Fig. I. Reduction to Fig. I. was thought useful because it was regarded as the most perfect Figure, the Figure to which alone the *Dictum de omni et nullo*[1] applies directly, in which the argument is most obviously valid, and in which the S and P of the Conclusion occur as S and P in their respective Premisses. The verse referred to is as follows:—

> BARBARA, CELARENT, DARII, FERIO que prioris;
> CESARE, CAMESTRES, FESTINO, BAROKO, secundae;
> Tertia, DARAPTI, DISAMIS, DATISI, FELAPTON,
> BOKARDO, FERISON habet; Quarta insuper addit
> BRAMANTIP, CAMENES, DIMARIS, FESAPO, FRESISON.

The words in capital letters are the names of the valid Moods in the four Figures respectively; the initial letters of the names in the 2nd, 3rd, and 4th Figures correspond to the initial letters of the names in the 1st Figure, and every inferior Mood reduces to the Mood in Fig. I., which begins with its own letter; *e.g.* Cesare (in Fig. II.) reduces to Celarent. The letter *m* wherever occurring, signifies transposition of Premisses; *e.g.* in reducing Camestres to Celarent, the Premisses are transposed. The letters *s* and *p*

[1] This *Dictum*—the traditional Canon of Syllogism—may be stated as follows:— *Whatever may be predicated of a term distributed, may be predicated in like manner of everything contained under it.*

signify Conversion (Conversion *S*implicter and Conversion *P*er Accidens); *e.g.* in reducing Camestres to Celarent the Minor Premiss and the Conclusion are converted, in reducing Darapti to Darii, the Minor Premiss is converted.

The vowels of the Mood-names signify the kind of Class Propositions of which each Mood is composed; *e.g.* Ferio has E for Major Premiss, I for Minor Premiss, and O for Conclusion. The only remaining significant letter in the verses is K, which occurs in two names, Baroko and Bokardo; this K signifies Indirect Reduction, which will be explained and exemplified further on.

The Reductions of the other Moods, for which the Mnemonic verse supplies a key, are Direct or Ostensive, and consist simply in Transposition of Premisses or of Terms.

The name Bramantip requires special explanation. By transposition of the Premisses of this Mood, and Conversion of the Conclusion, we reach (*not* AAA but) AAI in Fig. I., which is Barbara with a weakened Conclusion, that is, with an I Conclusion when an A Conclusion would have been justified *by the Premisses*—but this A Conclusion would *not* be justifiable as an Immediate Inference from the I Conclusion of Bramantip. The *p* of this name must be understood to indicate that if we took Barbara exactly as it stands in Fig. I., and converted the Conclusion

All R is Q, we should get Some Q is R,

which is the Conclusion of Bramantip when reduced to Fig. I.

We will go through the unweakened Moods of Fig. II., Fig. III., and Fig. IV., exhibiting in each case the Reduction to Fig. I.

Cesare	reduces to	Celarent.
No Q is N		No N is Q (M-P to P-M)
All R is N		All R is N
No R is Q		No R is Q.
Camestres	„	Celarent.
All Q is N		No N is R
No R is N		All Q is N
No R is Q		No Q is R
Festino	„	Ferio.
No Q is N		No N is Q
Some R is N		Some R is N
Some R is-not Q		Some R is-not Q.
Darapti	„	Darii.
All N is Q		All N is Q (M-S to S-M)
All N is R		Some R is N
Some R is Q		Some R is Q.
Disamis	„	Darii.
Some N is Q		All N is R
All N is R		Some Q is N
Some R is Q		Some Q is R.

Datisi	reduces to	Darii.
All N is Q		All N is Q
Some N is R		Some R is Q
Some R is Q		Some R is Q.
Felapton	”	Ferio.
No N is Q		No N is Q
All N is R		Some R is N
Some R is-not Q		Some R is-not Q.
Ferison	”	Ferio.
No N is Q		No N is Q
Some N is R		Some R is N
Some R is-not Q		Some R is-not N.
Bramantip	”	Barbara.
All Q is N		All N is R (P-M to M-P)
All N is R		All Q is N (M-S to S-M)
Some R is Q		Some Q is R
		(*Cf. ante*, p. 124.)
Camenes	”	Celarent.
All Q is N		No N is R
No N is R		All Q is N
No R is Q		No Q is R.
Dimaris	”	Darii.
Some Q is N		All N is R
All N is R		Some Q is N
Some R is Q		Some Q is R.

Fesapo	reduces to	Ferio.
No Q is N		No N is Q
All N is R		Some R is N
Some R is-not Q		Some R is-not Q.
Fresison	”	Ferio.
No Q is N		No N is Q
Some N is R		Some R is N
Some R is-not Q		Some R is-not Q.

Baroko and Bokardo, as already mentioned, are reduced by a different process (called Indirect Reduction or *Reductio ad impossibile*) to Barbara, and this process is indicated by the K which occurs in them only. This Indirect Reduction is as follows :—

We take, say, Baroko—namely,

All Q is N
Some R is-not N
Some R is-not Q—

Q - N
(R - $\bar{N}$).

and make the supposition that the Conclusion, Some R is-not Q, is to be questioned, not because the Premisses are doubted, but because this form of Syllogism is supposed to be less trustworthy than the First (and 'perfect') Figure. If Some R is-not Q, is not true, then its Contradictory All R is Q, must be true. Let us take this as a Premiss in a new Syllogism, and take one of the Premisses of Baroko for the other Premiss, thus—

All Q is N
All R is Q.

These Premisses yield the Conclusion

All R is N.

But All R is N contradicts Some R is-not N, the Minor Premiss of Baroko, and—by supposition—the Premisses of Baroko were not to be questioned. As, however, the new Syllogism is in the First Figure, we cannot doubt that the Conclusion is rightly deduced from the Premisses. The fault, therefore, must be in the Premisses of the new Syllogism. But All R is N (being one of the original Premisses) is right. Therefore it must be the Premiss All R is Q which is at fault. Therefore All R is Q must be false. Therefore its Contradictory must be true. Therefore Some R is-not Q is right, and Baroko is proved to be valid.

The reasoning in the case of Bokardo proceeds in precisely the same manner. Bokardo—

Some N is-not Q
All N is R
Some R is-not Q—

reduces indirectly to

All R is Q
All N is R
All N is Q.

But All N is Q contradicts the Major Premiss of Bokardo, therefore the new Syllogism is wrong, therefore the old Syllogism is right.

Baroko and Bokardo, however, can be reduced ostensively by the help of Obversion and Contraversion, thus:—

Baroko—All P is M (1)
Some S is not M (2)
Some S is not P (3)—

reduces to

No not-M is P . . . . contraverse of (1)
Some S is not-M . . . obverse of (2)
Some S is-not P.

This is Ferio in Fig. I., and we may take the name Faksoko as a key, understanding *k* to mean Obversion, and *s* (as before) to mean Conversion.

Bokardo—Some M is not P (1)
All M is S (2)
Some S is not P (3)—

reduces to a Syllogism in Darii, namely,

All M is S (2)
Some not-P is M . . . contraverse of (1)
Some not-P is S . . . contraverse of (3)

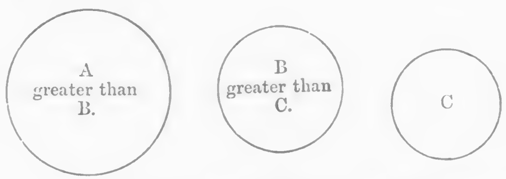
This may be symbolised by the verbal combination Doksmanoks, *k* having the same meaning as in Faksoko, and *s* and *m* retaining the signification which they have in the other Mnemonic names.

Relative Categorical Arguments are Arguments of which the Premisses are Relative Propositions; they do not—like Syllogisms—conform to one strict and invariable pattern; and the Canon and Rules of Syllogism will not apply directly to them—but their cogency (to any one who understands the relations of

the System they refer to) is just as evident as that of Syllogistic or Absolute Arguments. It is, moreover, possible to express them in Syllogistic form (*cf.* p. 37).

Take, for instance, the following Relative Argument (which is of the particular species called *A fortiori*)—

A /is/ greater than B
B /is/ greater than C
———————————
A /is/ greater than C.



Here we have four Term-names, but yet a perfectly valid argument—that which takes the place of a true Middle Term, and supplies the point of connection between A and C, being B; which, as the Premisses imply, is at the same time *greater* than C and *less* than A (*A is greater than B* being equivalent to *B is less than A*). The Premisses give us not only a statement of two identities, but also information as to the relations of three distinct objects—A, B, and C.

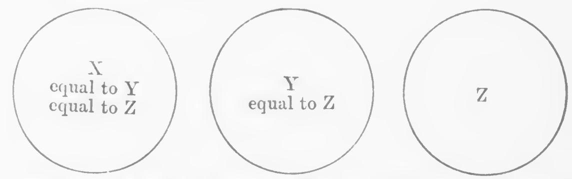
The Argument may be expressed syllogistically as follows:—

(A thing which is greater than a second thing which is greater than a third thing) is (greater than that third thing)

(This thing [A]) is (greater than a second thing [B] which is greater than a third thing [C])
———————————
∴ (This thing [A]) is (greater than the third thing [C]).

Take, again, the Argument

X is equal to Y
Y is equal to Z
———————————
X is equal to Z



Here, again, we have four Term-names, and three distinct objects referred to, one of which fulfils the function of a Middle Term by affording a point of connection between the other two objects.

The Argument may be put syllogistically as follows:—

Any thing that is equal to *another thing* (Y) /is/ equal to *what* Y *is equal to* (Z)
This thing (X) /is/ equal to *another thing* (Y)
———————————
This thing (X) /is/ equal to *what* Y *is equal to* (Z),

or

If any X is equal to Y, that X /is/ equal to Z that Y is equal to
This X is equal to Y
———————————
This X /is/ equal to Z that Y is equal to.

Other arguments of a similar nature are those in which the Systems of relations referred to by the constituent Propositions are relations of time, of family connection, of position in space, and so on. *E.g.*—

A is father of B
B is father of C
C is grandson of A.

Here we have six terms, but still three, and only three, related objects, one of which, B, affords the point of connection between the two others. The argument is perfectly cogent and perfectly evident—

A-B-C A is to the left of B
B is to the left of C
C is to the right of A

is a similar Argument.

It does not appear, on this view, that we can get a more precise Canon of Relative Categorical Mediate Inferences than the following:—

If two objects, A and B, are related to each other, and B is related to a third object, C; then C is related to A in accordance with the laws of the System to which A and B and C belong.

SECTION XIII.

INDUCTIONS.

Categorical Mediate Inferences, whether Syllogistic or Relative, may be divided into Deductions and Inductions (*cf.* Section ix., on Inferences in General). These two kinds of argument are similar, but not precisely similar. Take the following instances of Deductive Arguments:—

(1) London is the largest city in the world
London is the metropolis of England
The metropolis of England is the largest city in the world.

(2) Those two fowls are worth ten shillings each
Those two fowls are Silver Hamburghs
Some Silver Hamburghs are worth ten shillings each.

(3) All horned animals are ruminants
All cows are horned animals
All cows are ruminants.

(4) All white violets are fragrant
This flower is a white violet
This flower is fragrant.

(5) Spring, Summer, Autumn, and Winter make up a year
Spring, Summer, Autumn, and Winter are the four seasons

The four seasons make up a year.

In none of these do we find that the Conclusion is more general than either of the Premisses. And among the most important of Deductive Arguments are those which—as (3) and (4)—start from the assertion of laws or general statements, and combine two such to reach the Conclusion, or apply one law to some particular case or cases.

In an Induction, on the other hand, we have always *one* Premiss Particular and the Conclusion Universal—we arrive, by the help of *facts* or *particulars*, at some fresh *generalisation* or *law*. For instance, having proved that one isosceles triangle has the angles at the base equal, we conclude that *all* isosceles triangles have the angles at the base equal; having ascertained that one rabbit has died from the administration of a certain quantity of arsenic, we conclude that any rabbit would die in consequence of a similar dose; having observed that one bunch of fresh white violets has a particular fragrance, we infer that other bunches of the same fresh flower will have a similar fragrance. But our Inferences cannot be of the form.

This isosceles triangle has the angles at the base equal
∴ *All* isosceles triangles have the angles at the base

equal—and so on; for if so they would be not Mediate but Immediate Inferences, and, moreover, illegitimate Immediate Inferences. We must have *two* Premisses, of which one is a Universal Proposition; and this Universal, together with the Particular Premiss, must furnish a complete justification for the Conclusion.

Why is it that I feel justified in inferring from the one isosceles triangle to all isosceles triangles, from the one rabbit dosed with arsenic to all rabbits dosed with arsenic, from the one bunch of violets to all bunches? It would appear that the justification is to be found in what may be called the Principle of Interdependence. This Principle may be stated thus—

Every characteristic (*cf.* pp. 5, 6), is inseparable from *some* other characteristics; and there is an *uniformity* of interdependence between characteristics.

I use Interdependence to mean inseparable co-existence (Concomitance) or inseparable antecedence or consequence (Cause and Effect); and the Principle of Interdependence as above stated may be amplified as follows:—

Every characteristic of anything has some Concomitants, and every change or event has some Cause and some Effect; moreover, not only is there this connection in any given case, but the connection is uniform—that is, not only must every characteristic be inseparable from *some* other characteristics, but it is *similar* characteristics that are interdependent—

i.e. phenomena that are once connected as Concomitants, or Cause and Effect, are *always* so connected.—An Inductive Mediate Inference will therefore be of the form

> Whatever has once been a cause of Y will be always a cause of Y
> X has been once a cause of Y
> ---
> X will be always a cause of Y (= All X is cause of Y)—

or

> Any characteristics that are once concomitant with A will be always concomitant with A
> BC are once concomitant with A
> ---
> BC will be always concomitant with A (= All BC are concomitant with A).

And it seems clear that Uniformity of Causation must depend upon Uniformity of Concomitance—our power of predicting that one event A will be followed by another event B must depend wholly upon co-existence of characteristics in the Subjects concerned—*event* meaning *change in Subjects of Attributes.* (The above Inductive Inferences can be equally well expressed in Inferential form—their expression in Alternative form is awkward and inappropriate.)

If we have seen one animal dosed with arsenic and subsequently die, and hence conclude that another animal called by the same name, and dosed with an equal amount of arsenic, will die, is not our inference based upon the assumption of a certain constant coinherence of characteristics, both in the animal and in the poison—a coinherence of such a kind that when the two subjects are so collocated as to act upon each other, a result similar to that produced in the first case will be produced in the second also? If the properties of this arsenic are different from those of the other, or if the second animal, though looking like the first, has a different internal constitution, there is no reason why death should result. (*Cf.* Mill, *Logic*, Bk. iii. ch. xxii. sect. 2.) This sort of uniformity—an uniformity primarily of co-existence—it is which we look for, and of which we constantly discover fresh cases, these enabling us to predict that if Subjects having certain characteristics are collocated, certain changes in them will take place. Laws of *Succession* in events seem thus to depend upon laws of *Co-existence* of characteristics in Subjects. On the other hand, we cannot predict new collocations of Subjects of Attributes.

It seems, further, that not only is every characteristic invariably accompanied by a certain other characteristic, as Bacon surmised, but also that every kind of characteristic is one of an unique group with which it is invariably and inseparably connected. We certainly act as if we believed this; from the perception of a mere odour, we infer unhesitatingly the neighbourhood of roses, or jessamine, or lavender, of coffee or tea, hay, ripening corn, freshly fallen snow, or a beanfield; from a mere vocal sound, we infer the neighbourhood of a man or woman, or child, or bird,

dog—or even a particular individual in a particular mood. A mere touch or taste will enable us fully to describe objects of a familiar kind; the mere view of a thing will enable us to say what it is called, what other characteristics it possesses, how it will behave under a great variety of circumstances. For instance, if I see an object looking like a squirrel, sitting on the top bar of a stile, or on a branch, I unhesitatingly say that it is called *a squirrel*, and infer that if I startle it, it will escape with the kind of movement common to squirrels; that if I shoot it and examine its structure, I shall find it to have a backbone, a brain, etc. No two things are alike only in visual appearance or only in smell, or only in taste, and so on. From one bone a whole skeleton may be made out; from one specially modified symptom the whole diagnosis of a disease.

In all these cases we proceed by the rule that if anything, X, is like another thing, Y, in one respect, it is like it in a plurality of respects. But the admission of this rule, and of the Principle of Interdependence which it involves, is not all that is necessary —before any practical application of them can be made, we not only need to know that similar phenomena have similar interdependents, but also to know, *what*, in any given case, those interdependents are.

How are we to proceed in determining this in any case? For instance, on what grounds should we justify our belief that fragrance of a particular character

is inseparable from the various qualities of form, colour, etc., characteristic of white violets (QWV), that equality of angles at the base is interdependent with equality of sides in a triangle, that capacity of destroying animal life is inseparable from the qualities of taste, colour, specific gravity, and so on, which we regard as characteristic of arsenic?

I think we should say that we believe in this interdependence in the case of the fragrance, because wherever we have recognised the fragrance, we have found that violets were present—it has not occurred in company with roses, geraniums, daisies, mignonette, and so on. All cases of the fragrance have *agreed* in occurring in connection with the presence of violets. On the strength of this Agreement, we conclude (by the Method of Agreement) that there is interdependence between the fragrance, and the various characteristic attributes of form, colour, etc., by which we recognise white violets.

If we add to the above reason the further consideration that we have never met with fresh white violets unaccompanied by the fragrance in question, then we further strengthen our conclusion as to the interdependence of the odour and the other attributes, finding that not only is the *presence* of the odour accompanied by the *presence* of the other qualities, but also the *absence* of the odour is accompanied by the *absence* of the other qualities. Hence we conclude by what is called the Method of Agreement in

Presence and Absence, or the Joint Method of Agreement and Difference.

The Arguments may be formulated thus—

Method of Agreement:

If in my experience F has always been accompanied by QWV, then F is inseparable from QWV; F has been so accompanied; ∴ F is inseparable from QWV, and all cases of F are cases of QWV.

Method of Agreement in Presence and Absence:

If, in my experience, the presence of F has always been accompanied by the presence of QWV, and the absence of F has always been accompanied by the absence of QWV, then F and QWV are inseparable; the presence and absence of F have been so accompanied; ∴ F and QWV are inseparable.

And F and QWV being inseparable, it of course follows that all cases of F are cases of QWV, and all cases of QWV are cases of F.

(This latter argument might also be expressed as follows:—

If F does not occur without QWV, and QWV does not occur without F, then F and QWV are inseparable, etc.)

Here we conclude inseparability from several observations of concurrent presence and concurrent absence; our conclusion is based on the principle that

characteristics which, whenever they are met with, are met with together, must be inseparable co-existents. We do not *perceive* any intrinsic connection between the form, growth, and so on, of the flower and the accompanying fragrance.

But it is different in the case of the connection between Equality of Sides in a triangle and Equality of the Angles at the Base. Here the interdependence of ES and EAB is a matter of direct perception—having gone through the proof in a single case, the inseparability is apparent beyond the possibility of doubt—we *see* that if the sides are equal the angles must be equal, and if the angles are equal the sides must be equal. It is because of this actual perception of inseparability, that *one* instance is always sufficient in the case of Mathematical Inductions, that we do not use the Inductive Methods in establishing them, and that Mathematical generalisations are regarded as having a certainty that is unquestionable and unique. The inseparability is obvious and self-evident, instead of being assumed (as in the case of the violets), in order to account for repeated cases of co-existence.

In the case of any deadly poison, such as arsenic, our conclusion that the qualities (of taste, colour, specific gravity, and so on) which we regard as characteristic of arsenic are inseparable from poisonousness, has probably been reached by the help of what is called the Method of Difference. We observe

that the introduction into an animal system of the substance having the characteristic qualities of taste, etc., referred to, is followed by speedy death, and we argue as follows:—

If the introduction of A was followed by D, A is inseparable from D; The introduction of A was followed by D, therefore A is inseparable from D.

It is, of course, understood that the introduction of A was the only thing that happened to which it would be possible to attribute D. A single careful experiment by the Method of Difference is considered sufficient to prove interdependence. If a dose of some new substance to a healthy animal were followed by immediate convulsions ending in death, no one would doubt the poisonous quality of the substance. Or, to take a very homely example—if I put a lump of sugar into a cup containing coffee and milk, and on tasting the mixture find that it has a sweetness which it had not before the introduction of the sugar, I feel perfectly sure that with the qualities of colour, weight, etc., which were apparent in what I called the lump of sugar, there was connected the capacity of sweetening a liquid in which it was dissolved—in other words, I know that the dissolution of the sugar in the coffee is what has caused its sweetness.

Or suppose that my fire is smoking furiously, and I shut the window, which was open, and immediately the smoking ceases, I conclude that the open window was [part] cause of the smoking. Or if I am wearing

blue spectacles and everything looks blue, and then I put on green spectacles and nothing looks blue, I conclude that it was the blueness of the spectacles which made everything look blue to me.

The Method called the Method of Residues is a form of the Method of Difference. It is extremely valuable, and is constantly used both in the most everyday matters and also in scientific investigations. For instance, if I fill a large jar with honey, having previously weighed the jar, then the simplest mode of ascertaining the weight of the honey is to weigh the whole, and subtract the weight of the empty jar. Supposing that the jar empty weighed 2 lbs., and that with the honey in it weighs 12 lbs. Then from 12 I subtract 2, and conclude that the honey weighs 10 lbs. The case may be represented as follows:

(Jar + Honey)	is	(2 lbs. + 10 lbs. in weight)
(Jar) . . .	is	(2 lbs.)
∴ (Honey)	is	. . (10 lbs.)

(Jar) and (2 lbs.) being subtracted (Honey) and (10 lbs.) remain as a Residue.

I know that there is nothing in the scales but the Jar and the Honey. I know that together these weigh 12 lbs. I also know that the Jar alone weighs 2 lbs. Therefore the Residue on the one side, namely 10 lbs., must belong to the Residue on the other side, namely the Honey—the introduction of the Honey has caused an increase of 10 lbs. in weight. I know henceforward that inseparable from the other

attributes of my Jar is a capacity of holding 10 lbs. of Honey—that inseparable from the other attributes of that 10 lbs. of Honey is the capacity to fill my Jar (or any vessel of the same dimensions).

What is called the Method of Concomitant Variations is also a mode of the Method of Difference. In this Method, as its name implies, interdependence between any two phenomena is inferred from the fact that the amount of the one varies with the amount of the other. If I find that two lumps of sugar make my tea sweeter than one, and that the introduction of a third makes it sweeter still, I have a proof, by the Method of Concomitant Variations, of the sweetening quality of sugar in that instance. Or if I find that the barometer falls as the weather gets worse, and rises as the weather improves, I infer interdependence between the state of the weather and the height of the barometer, in the cases observed.

We may perhaps sum up as follows the postulates upon which these Methods (*cf.* Index, Mill's *Methods of Experimental Inquiry*) proceed :—

If A has never been found without B (nor B without A); or if the introduction of A is followed by B, or the removal of A by the disappearance of B; or if variation of the quantity of A is accompanied or followed by variation in the quantity of B; or if in any clearly marked-off set of attributes or events (AC-BE) C and E are interdependent—then A and B are interdependent.

For the sake of illustration the reasoning involved in the inductive generalisation about Arsenic may here be stated in full :—

> If the introduction of one phenomenon (*e.g.* Arsenic) is followed by a second phenomenon (*e.g.* Death), then the two phenomena are interdependent;
>
> The introduction of Arsenic was on a given occasion followed by Death:
>
> ---
>
> ∴ Arsenic and Death were on a given occasion interdependent.

Here (having first of all assumed that any phenomenon in any given case is inseparable from *some* other phenomena) we prove by the Method of Difference, that two *given* phenomena [namely administration of Arsenic and Death] are [on a given occasion] inseparable [because the introduction of A has been followed by D]. The interdependent phenomena in question not being co-existent but antecedent and consequent, they are related as Cause and Effect. Therefore we go on

> If Arsenic was on one occasion Cause of Death, Arsenic will be always Cause of Death;
>
> Arsenic was on one occasion Cause of death;
>
> ---
>
> Arsenic will be always Cause of Death—

that is

> All Arsenic is a Cause of Death.

Here we prove the general law from the special case by help of the principle of *Uniformity* in Causation.

In an Inductive argument by ANALOGY, the interdependence that we rely upon is inferred from the complexity or amount of interdependence already known or supposed. For instance, if we know that two objects, X and Y, are alike in having a large number of interdependent attributes—say (A,B,C,D,E)—and X is found to have the further attribute F, we conclude that F is interdependent with the group (A,B,C,D,E)—and therefore that Y is also F. There is a considerable presumption that if a large group of attributes occur in more than one individual, those attributes are inseparable—and if, in any object, a large number of its attributes are inseparable, there is a considerable presumption that any other attribute of it will be inseparable also. In Analogy we argue *explicitly* from Particular to Particular, but *implicitly* from Particular to Universal.

If a botanist in exploring a new region meets a flower which is new to him, and which has very distinctive form and colouring, and also on a near approach is found to have a very peculiar fragrance; and then he observes another flower precisely similar to the first in form and colour—he will have reason to expect that the second flower will have an odour like the first. In doing this he is making an inference by Analogy. His thought is: The second flower resembles the first in form, colour, size, and so on—therefore the

form, colour, size, and other visible attributes common to the two flowers are interdependent—therefore probably the further attribute observed in the first flower was interdependent with the numerous visible attributes—and if the several attributes were interdependent in the first case, they will be interdependent also in the second—(and therefore in all).

The Principle of Interdependence involves the axiom that No two things are *alike* in *one* respect only. To this we may add that No thing is *unlike* another in *one* respect only: nor does a thing *change* in *one* respect only.—If we observe two things to be unlike in one respect, we always infer further unlikeness; if we observe a person or thing to be changed in one point, we always infer further change. Two axioms complementary to these are, that No two things are *alike* in *all* respects; and that No two things are *unlike* in *all* respects.

The maxim by which we are guided in practice might perhaps be said to be this, *Apparent* likeness, unlikeness, or alteration is accompanied by *non-apparent* likeness, unlikeness, or alteration.

In an Inductive Generalisation there is a characteristic element which essentially differentiates it from all the other Relations of Propositions with which Logic deals, namely, an element of Discovery—since the very condition of Induction is perception or recognition of the Universal in the Particular. In Induction there seem to be three aspects or stages.

First, a perception of connection (co-existent or sequent) between phenomena in some particular case or cases. Second, a proof that the connection in that case or cases is one of interdependence. Third, an extension from the known case to the unknown cases—a recognition that the particular interdependence involves a connection holding universally. In Mill's treatment of Inductions, the first aspect, and in Whewell's, the third aspect, are comparatively in the background. The first stage is the sphere of Hypothesis. It is clear that this must both chronologically and logically come first. Before interdependence between A and B can be proved or even investigated, A and B must have been thought of as connected, the notion or Hypothesis of A's being Concomitant of B, or Cause of B, must have occurred to some one's mind.

The Hypothesis may be simple or complex, easy or difficult, but in every case of Induction it is the indispensable starting-point.

The business of Logic, at this juncture, is to require the fulfilment of certain conditions on the part of any Hypothesis before it is regarded as admissible. These conditions appear to be, *first*, that the Hypothesis should be in harmony with other knowledge; *second*, that it should (at least partially) explain and connect the facts to which it is applied.

The remaining business of Logic in Induction is, to *justify* (*a*) the Hypothesis and (*b*) its extension from known to unknown cases.

I have already spoken, in this Section, of the assumptions, and the connections of Propositions which seem to be required for such justification. But the assumptions themselves (the Principle of Interdependence, etc.) perhaps need justification. The justification might be offered, that these very assumptions are necessarily involved in all inductions—inductions which we constantly make, and on the trustworthiness of which we unhesitatingly depend. If we accept the inductions we must in consistency accept the principles which they involve. And if we do not accept the inductions, we are entangled in a web of hopeless inconsistency. And in a later Section (Section XIX.) we shall see the extent to which the Principle of Induction is on the same footing as the Principle which expresses the condition of significant categorical assertion.

SECTION XIV.

INFERENTIAL MEDIATE INFERENCES.

An Inferential Mediate Inference (or Argument) is a Mediate Inference consisting of Inferential Propositions, or of Inferential and Categorical Propositions.

Inferential Arguments are of two kinds, namely (I.) Pure; (II.) Mixed.

(I.) A Pure Inferential Argument is an Argument of which the Conclusion and both Premisses are Inferential.

(II.) A Mixed Inferential Argument is an Argument of which the Major Premiss is Inferential, the Minor Premiss and the Conclusion being Categorical.

Pure Inferentials may be divided into (1) Hypotheticals and (2) Conditionals; Mixed Inferentials into (3) Hypothetico-Categoricals, and (4) Conditio-Categoricals.

The following may be suggested as Canons of (1), (2), (3), (4) respectively:—

(1) If from one Proposition, A, another Proposition, C, is inferrible; and from C there is inferrible a third Proposition, D: then D is inferrible from A, and not-A from not-D.[1]

[1] A valid Inferential Argument may need to have some of its Propositions obverted before this Canon will apply directly.

(2) If from the presence of a distinctive mark, D, in any member of a class, K, a second mark, M, may be inferred; and if from the presence of M in any K the presence of a further mark, M′, may be inferred: then from the presence of D in any K the presence of M′ may be inferred, and from the absence of M′ in any K the absence of D may be inferred.[1]

(3) If one Proposition, C, is inferrible from another Proposition, A; then the assertion of A justifies the assertion of C, and the denial of C justifies the denial of A.

(4) If from some distinguishing mark, D, in any member of a given class, K, some further mark, M, is to be inferred; then the assertion that any K is D justifies the assertion that that K is also M; and the assertion that any K is not M justifies the further assertion that that K is also not D.

[1] A valid Inferential Argument may need to have some of its Propositions obverted before this Canon will apply directly.

TABLE IX.

INFERENTIAL SYLLOGISMS.

- *Pure Inferential Syllogisms.*
  - *Hypothetical Syllogisms.* *E.g.*—
    If A is B, C is D;
    If E is F, A is B;
    ∴ If E is F, C is D.
  - *Conditional Syllogisms.* *E.g.*—
    If any D is E, that D is F;
    If any D is H, that D is E;
    ∴ If any D is H, that D is F.
- *Mixed Inferential Syllogisms.*
  - *Hypothetico-Categorical Syllogisms.* *E.g.*—
    If S is P, P is S;
    S is P (P is-not S);
    P is S (S is-not P).
  - *Conditio-Categorical Syllogisms.* *E.g.*—
    If any D is E, that D is F;
    XD is E (XD is-not F);
    XD is F (XD is-not E).

SECTION XV.

ALTERNATIVE OR DISJUNCTIVE MEDIATE INFERENCES.

An Alternative Argument may be defined as

> An Argument of which *one* Premiss is an Alternative Proposition or a combination of Alternative Propositions; and of which one Premiss and the Conclusion, or both Premisses, or both Premisses and the Conclusion, *may* be Alternative.

Alternative Arguments (or Mediate Inferences) may be divided into, (I.) Pure, and (II.) Mixed.

(I.) In a Pure Alternative, both of the Premisses and the Conclusion are Alternative. *E.g.*

C is D or A is not B
E is F or C is not D
―――――――――――
E is F or A is not B.

(II.) Mixed Alternatives may be distinguished as (1) Categorico-Alternative, in which either constituent (Major or Minor Premiss or Conclusion) of the Argument that is not Alternative is Categorical; and (2) Inferentio-Alternative, in which the Major Premiss is always inferential in form, and the other Premiss and

the Conclusion are either (*a*) one Alternative and the other Categorical, or (*b*) both Alternative.

Inferentio-Alternative Syllogisms, which include what are commonly called Dilemmas, may be divided into Hypothetico-Alternative and Conditio-Alternative; and each of these again into Ponend and Tollend (corresponding to the affirmative and negative forms of Mixed Inferential Arguments).

The following may be suggested as Canons of

Pure Alternatives:—From two Alternative Propositions, of which one, and one only, has an Alternative that is the negative of an Alternative in the other (the other Alternatives being distinct from the first and from each other), a third Alternative Proposition may be inferred, having for its members the remaining Alternatives of the Premisses.

Categorico-Alternatives:—The denial of one member (or more) of any Alternation (or combination of Alternations) justifies the affirmation of the other member or members.

Hypothetico-Alternatives:—Of two or more Hypothetical Propositions connected by *and*, if the Antecedents be alternatively affirmed, then the Consequents may be affirmed; and if the Consequents be alternatively denied, then the Antecedents may be denied.

Conditio-Alternatives:—(i.) Of any two Conditional Propositions connected by *and*, if the Predicates of the Antecedents are alternatively affirmed of what is indicated by the Subject-name of the Antecedents: then the Predicate[s] of the Consequent[s] may be affirmed of the same.

(ii.) Of any two Conditional Propositions connected by *and*, if the Predicates of the Consequents are alternatively denied of what is indicated by the Subject-name of the Antecedents: then the Predicates of the Antecedents may be denied of the same.

TABLE X.

ALTERNATIVE OR DISJUNCTIVE SYLLOGISMS.

Pure Alternative Syllogisms.
E.g.—
C is D, or A is not B
E is F or C is not D
E is F or A is not B.

Mixed Alternative Syllogisms.

Categorico-Alternative Syllogisms.
E.g.—
E is F, or E is H
E is not F
E is H

Inferentio-Alternative Syllogisms.

Hypothetico-Alternative Syllogisms.
E.g.— (*Ponend.*)
If E is F, G is H ; and if K is L, G is H ;
But E is F, or K is L ;
∴ G is H.

(*Tollend.*)
If E is F, G is H ; and if K is L, M is N ;
But G is not H, or M is not N ;
∴ E is not F, or K is not L.

Conditio-Alternative Syllogisms.
E.g.—
If any D is E, that D is F ; and if any D is H, that D is F ;
But this D is E, or this D is H ;
∴ This D is F.

SECTION XVI.

DIVISION, CLASSIFICATION, AND SYSTEMATISATION.

In the Sections on Immediate Inferences and Incompatible Propositions, we were concerned specially with inferential relations between *two* Propositions: in discussing Mediate Inferences, we dealt with the inferential relations between two Propositions taken together and a third; in this Section we go on to consider the questions of Method which come under the head of Classification and Systematisation.

Perhaps this is the most convenient place for a word with reference to the general arrangements of Propositions and Groups of Propositions, with a view to the communication or recording of knowledge. In this case, as in the case of Definitions, the rules which we can lay down are not in themselves sufficient to secure good results, though they go some way towards it, and the breach of them certainly entails bad results. We may say briefly that, in any Discourse or Treatise, the end which that Discourse or Treatise is intended to subserve should be steadily kept in view; that tautologies, obscurities, inconsistencies, and irrele-

vancies should be avoided; that the relations of the parts of the subject should be plainly set forth; and that it is desirable that Propositions which are accepted as fundamental should be themselves self-evident, or inferences from other Propositions which are self-evident. (We cannot, of course, start originally from statements which require proof: if we professed to do this, it would be the statements given in proof that we should really start from; we have to *begin* with something that is incapable of proof, and can be accepted without proof.)

The further conditions of a satisfactory choice and articulation of material are to be found in acuteness, sagacity, ingenuity, industry, trained skill, and other intellectual and moral qualities which enable their possessors to make right selections and happy guesses in cases where rules are either useless or not forthcoming.

Classification, which is bound up with Division, should be distinguished from *Classing*, which has a close connection with Definition. Classing consists in grouping together a number of numerically distinct *individuals* in virtue of their possession of similar attributes, these attributes being those which are unfolded in the definition of the class-name.

In Classification, we are concerned with the relations of a number of *classes*, the objects composing those classes being regarded as members of a system of individuals. These relations may be expressed in a

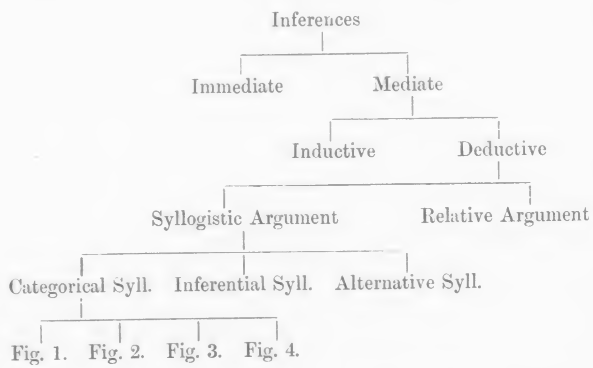
series of Relative Propositions—(*e.g.* Triangles /are/ divided into Equilateral, Isosceles, and Scalene, etc.) —but they are frequently and conveniently expressed in Tables. A Table of Family Relationships, for instance, presents clearly and in brief compass a multitude of relationships between persons which could only be conveyed with tediousness and much risk of confusion by Propositions alone, without the aid of Tables. The help which these give is similar to that afforded by maps, or by diagrammatic representation.

In all cases, the function of a classification or systematisation, however presented, is to facilitate comprehension of the relations of objects to one another, to bring out the Unity in Difference which belongs to any group of related things.

I observed, just above, that Classification is bound up with Division—it may indeed be said that Division and Classification are the same thing looked at from different points of view; any table presenting a Division, presents also a Classification. A Division starts with unity and differentiates it; a Classification starts with multiplicity, and reduces it to unity, or at least to order. If the Classification stops short of unity, it presents not one Division, but a plurality of Divisions. A Table is generally most convenient which starts from unity—that is, which is primarily a Division. Some tables in Whewell's *Novum Organon Renovatum* are an example of the reverse arrangement, which

is that which naturally occurs in a synthetic procedure; while Division is as naturally the appropriate form in cases where the procedure is primarily analytical.

From a Division or Classification, a brief Definition of any Constituent class, except the Summum Genus or widest class, may be framed, by taking the Proximate Genus of that Constituent class, and adding to it the Differentia—that is, the characteristics by which the particular sub-class is marked off from the rest of the Genus. Take, *e.g.*, 'Fig. 1,' in the subjoined Table—

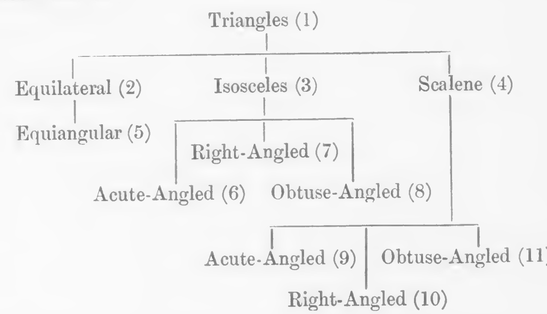


'Fig. 1' may be defined by giving the Proximate Genus (or next class above it), and adding to this the characteristics by which it is distinguished from Fig. 2, Fig. 3, and Fig. 4, thus—

'Fig. 1 is a Categorical Syllogism in which the

Middle Term is Subject in the Major Premiss, and Predicate in the Minor Premiss.'

A good Division or Classification should be appropriate to the purpose in hand; co-ordinate classes should never overlap; and at every stage of a Division or Classification, the co-ordinate classes should be identical in application or extension with the co-ordinate classes of every other stage, and with the Summum Genus. *E.g.* in the following Division or Classification—



the co-ordinate classes (2) (3) (4) do not overlap, nor do the co-ordinate classes (5) (6) (7) (8) (9) (10) (11); the co-ordinate classes (2) (3) (4) are identical in extension with (5) (6) (7) (8) (9) (10) (11), and each of these two groups of classes is identical in extension with the Summum Genus (1)—that is, they contain the very same objects.

If the name *Classing* is assigned to (*a*) the collection into groups of objects which are qualitatively

similar, but numerically distinct, and *Classification* to (*b*) the arrangement of such groups in their relations to one another, there still remains to be named and considered a third arrangement, namely (*c*) that of differing parts of a whole (whether single objects or groups of objects) in their relations to each other, and to the whole. This may perhaps be distinguished from (*a*) and (*b*) as *Systematisation.* This term seems more applicable than Classification to, *e.g.*, the arrangement of the Sciences in relation to one another, or the arrangement of the parts of an organic whole such as the human body, of genealogical relationships, of the subdivisions of any such quantitative whole as, *e.g.*, a ton, a square mile—and so on.

It may be observed that a Systematisation may often include Classification. For instance, the body of Logical Science itself, which must be regarded as a Systematisation, includes various Classifications—such as the Classification of Terms or Propositions. Again, in Morphology, which is a systematising rather than a classificatory Science, various Classifications are included.

SECTION XVII.

DEFINITION AND LANGUAGE.

By the Definition of any word is meant a statement of the meaning or signification of the word—that is, a statement of *the characteristics on account of which the name is applied, and in the absence of any of which it would not be applied.* We may take the view that every name is capable of being defined, if we include the characteristic of *being called by the name* among those characteristics of the thing which are comprised in the signification of its name. (There is, of course, no question that the name by which anything is called is a characteristic, and to us a very important characteristic, of it.) On this view even so-called Proper Names would have a Definition, but it would be a Definition giving only a minimum of information about the things called by the name; for of any object known to us merely by a Proper Name, we can only predicate (1) what is common to all Subjects of Attributes, (2) unique individuality, (3) a distinctive name, (4) what that name is. Take, for instance, any appellation which, from the circumstances of its use, the mode in

which it is written, or for any other reason, I know to be a Proper Name—*e.g.* Richmond. I can certainly affirm that any object to which this word applies (in its capacity of Proper Name), has the characteristics common to all Subjects of Attributes, has unique individuality and a distinctive appellation, namely Richmond. And for some purposes—*e.g.* statistics respecting the relative frequency of occurrence of certain names—the grouping of individuals in accordance with their names may be interesting and useful, just as the alphabetical grouping of words in a Dictionary or Index may be useful for reference. Still such classings are, from most points of view, highly artificial—that is, they do not seem to be strongly suggested by the things themselves which are classed (as, for instance, the division of animals into quadrupeds, birds, fishes, reptiles, and insects is suggested)—and for the general purposes of life, *what* a man's Proper Name is, is insignificant; what concerns himself and others is, that he should be known by some name or other. Hence, notwithstanding that it is possible to give a vague Definition to Proper Names, the Definition is not of much use. It does not serve for recognition in fresh cases; and a knowledge of the application in one case does not help us to a knowledge of the application in other cases. But with Attribute Names, Adjectives, and Common Names (*e.g.* Triangularity, Red, Fern), with any combination of these (*e.g.* A large oak-tree), and with any mixed name (*e.g.* Tom

Smith's brother), *in as far as* it consists of Attribute Names, Adjectives, or Common Names, it is the case either that Definition may serve for recognition, or that knowledge of application in one case helps us to knowledge of application in other cases.

With regard to such fundamentally important words as White, Cold, Visible, Tangible, Liquid, Pain, Pleasure, and so on (*cf.* Mill, *Logic*, i. 155, 9th ed.), it is necessary, in order to understand and apply the words, that one should have had *experience of the things* indicated, and also definite information in some given case, *of the applicability of the name to the thing.* Unless I have felt, I can attach no valid meaning to any word which indicates Sensation; unless I have seen colours, I can attach no valid meaning to any words which indicate the colours, Red, Blue, etc.: and unless in some individual case in my experience the names (or names which I know to be their equivalents) have been assigned to the things, I can never know the application of the names. And similarly with such words as Quixotism, Johnsonese, Aristotelian; they cannot be understood or defined without individual acquaintance with the character or works of the personages referred to.

I said above, '*these names, or names which I know to be their equivalents,*' because, of course, when I have once learned to attach *some* name to a thing, I can by means of that name learn all the other names of the thing. (It is obviously, to a large extent, by such means

that fresh languages are learnt.) For instance, if I have learnt the application of the word Pain, I need only to be told that *Suffering, Schmerz, Leiden, Douleur,* and so on, have an identical application, in order to understand those words when I hear them. In the case of certain other words—such as Trilaterality Octagon —Definition may be a guide to application, without any previous knowledge of the application of the word. For instance, if I know what is meant by Eight, by Side, and by Figure, I may be able to recognise an Octagon, and call it by its name the first time I see one. But it may be admitted that, in the case of most things, mere Definition alone is not the most satisfactory guide to identifying things *in the first instance* —and that unless we had actually met with triangles and circles, roses and fritillaries, castles and cathedrals, oaks and beeches, horses and dogs, lions and elephants, and so on, the names of those objects, however carefully defined, would convey but little meaning to us, and our thoughts about the objects themselves would inevitably be far more vague and faulty than they are at present. The construction of any Definition is, of course, necessarily subsequent to acquaintance with the thing defined (or its elements).

With Proper Names alone, of all Names, it is absolutely indispensable to have the application of the name pointed out in the case of every individual person or thing—the objects which have Proper Names interest us *as individuals* and not as mere members of classes. No doubt if it were possible to bestow upon individuals convenient names significant of all their qualities—past, present, and to come—such names would take the place of 'Proper' Names. But such names are obviously impossible, both because there never is such knowledge of individuals, and also because, if there were, names conveying the knowledge would be quite unadapted for use. What is indispensable, and at the same time possible, in the case of persons or things distinguished by Proper Names, is to attach to them names which indicate definitely and easily which of certain known individuals it is that in any given case is being referred to; and this function is fulfilled by Proper Names.

There are certain Names composed entirely of Attribute Names, Adjectives, or Common Names, and having a maximum of Signification, which have necessarily, or actually, an unique Application—*e.g.* The longest river in the world, The noblest friendship of antiquity. And in the case of such Adjectives as Shakespearian, Rembrandtesque, which are potentially general, it is quite possible that there may never exist anything to which those terms can be applied except the productions of Shakespeare and Rembrandt respectively. But the majority of Adjectives and of Attribute and Common Names have an application both actually and potentially general; and it is of such words that Definitions are ordinarily most useful. In these cases—that is, where we are concerned with

classes, and connections of characteristics—Definitions may both furnish guidance in application, and also help to bring to mind the characteristics of the things we are referring to.

Certain rules for the framing of Definitions are commonly provided in logical handbooks, of which it may be said that though a Definition which conforms to them may be bad, a Definition which does *not* conform is certainly not good. These rules are to the effect that a Definition must not be tautological, that it should be expressed in clear and simple and (preferably) affirmative terms, that the word defined and the Definition of it must have identical application, that the Definition must state the Attributes included in the Signification, and those only. It may be added that it is generally desirable that a Definition should be brief; hence the old rule that a Definition (of any Class Name) should be by Proximate Genus, and Differentia is a useful one. When we define *Man* as *Rational Animal* or *Triangle* as *Plane figure enclosed by three straight lines*, we are defining by Proximate Genus and Differentia. These definitions are both economical and adequate, because the terms *Animal*, *Plane Figure* are so significant; and they are obviously in accordance with the other rules given above.

Some of the most important Definitions are of Class-Names; and, as remarked in the previous Section, Classing has a close connection with Definition—for

while Classing consists in grouping together a number of *numerically distinct* things in virtue of their possessing *similar* characteristics, those characteristics constitute the Signification which is unfolded in the Definition. And the connection between Classing and Definition on the one hand, and Induction on the other, is also very intimate. For it may perhaps be said that the majority of Class-names are a result of Induction, and may be unfolded into a statement of the interdependence, or inseparable and uniform co-existence, of attributes—since it is by a combination of attributes, and not by merely *one* attribute or kind of attribute, that we know the objects called by those Class-names. Consider, for instance, such names as Violet, Oak, Squirrel, Water, Air, Circle. From our knowledge of the application and meaning of the word *Circle*, we may extract, *e.g.*, the proposition that any closed plane figure having every point of the circumference equidistant from a point within it, is a figure of which the diameters are equal. Similarly from a knowledge of the meaning and application of any of the other names instanced, we may frame Universal Propositions which assert a co-existence of characteristics.—And every fresh Induction that is summed up in the Signification of a Class-name is, of course, expressed in the Definition of the name.

It is easy to define *Definition* by saying that it consists in giving the Signification of Names; but we require to know further by what criterion to

decide which characteristics of a thing should be included in the Signification, and the settlement of the Signification is the most difficult and important point in defining. A Definition may give a Proximate Genus and Difference; it may be clear, simple, affirmative, and not tautological, Definition, and word defined may be exactly equivalent; but owing to a mistaken choice of Signification, it may be a very bad Definition. For instance, the Definitions of *Man* as *A featherless biped*, or *A bartering animal*, break no rules, and yet for ordinary purposes are absurd Definitions. Perhaps the only useful general rules that can be given for the choice of Signification are the following:—(1) The Signification ought to be as far as possible conformable to usage—as regards non-technical words, ordinary usage, and the authorities generally recognised (that is, current speech and writing, standard authors and accepted dictionaries); in the case of terms which are technical or quasi-technical (Slang, Scientific Terms, Provincialisms, etc.), the usage of those recognised as the most competent judges. (It is in an analogous way that we come to know—in as far as we do know—who are the best lawyers, physicians, orators, artists, and so on.) Signification ought to be (2) consistent; (3) appropriate to the purpose in hand—(*cf.* Sidgwick, *Principles of Political Economy*, bk. I. ch. ii. p. 54, 1st ed.);—also (4) the characteristics comprised in the Signification should be, if possible, impressive and

distinctive. In all cases, of course, limits are set to the variations of the Definition of any word by its Application. And with regard to the great body of words in any important language, their application is practically fixed, and a person who does not know what this application is does not know the language.

Since any Definition is framed with some definite end in view, and every class of objects has a multitude of common characters, and may be regarded from different points of view, every Class-name is susceptible of a plurality of Definitions, application remaining fixed—*e.g. Man* may be defined (as by Cuvier, in order to indicate his place in a certain classification of animals) as *A mammiferous animal having two hands;* or as *A rational animal;* or *An animal capable of speech;* or as *An animate creature responsible for his actions.* There is, however, even with reference to Application regarded as fixed, often a 'ragged edge of usage'—a margin of inconsistency which admissible Definition must exclude. In the case of a 'dead' language, *e.g.* Greek, there is complete fixity. In a 'living' language with a literature, though there is practical fixity at any given time, yet as manners and customs and life altogether change, and as knowledge increases, and fresh discoveries, fresh analyses, and fresh syntheses are made, some old words have to be modified, and some new words have to be adopted—it is not possible to confine the new wine in the old bottles, to keep a growing, changing body altogether

within the limits of a cut-and-dried integument. The necessity of names for new things is obvious—one of the first requisites of an adequate language is to have a name wherever it is wanted. A language that had a sufficiency of names and other words, every name having its Application definite and consistent, its Signification clear and known, no name having two applications, and no name being the synonym of any other, would be an almost ideal instrument of record and communication. In such a language many common causes of error would be absent — the synonyms which are a source of tautology; the words which are ambiguous because they have a plurality of meanings (as, for instance, Board, Nature, Interest), or a doubtful meaning (as, *e.g.*, Beauty, Natural, Luxurious), and give rise to confusion productive of fallacy; the dearth of appropriate terms, which necessitates the use of some roundabout awkward phrase, or some old word in a new sense (thus increasing ambiguity), or some new word which has the disadvantages of strangeness.

In the case, especially, of ambiguous words, the force which they have when used in assertion often depends greatly upon their context; and not only the verbal context, but also the unspoken context of circumstances—including even such circumstances as position on a page, kind of type, etc. The degree of dependence varies: in the case of words with more than one Application, the Application cannot be

guessed at without reference to context. But in such cases, Application being determined, Definition may be easy. Again, where general Application is not doubtful, shades of meaning may be largely determined by context. The Application of Proper Names seems to be entirely determined by context.

And where neither Application nor Definition would be held to be disputable, that unique, individual context which a word has in the mind of each person who uses it is often very important, and may be very misleading—the force and effect of a word or a phrase being largely determined by the associations and suggestions it brings with it. We find in this consideration a key to many controversies—among others, to the question in dispute between Mill and Jevons as to the force of Proper Names. Mill regards them as unmeaning, as conveying no information respecting the persons to whom they apply; while, on the other hand, Jevons regards them as giving more information than any other kind of name. The ground of dispute vanishes when we realise that what Jevons is thinking of is, the associations and suggestions called up by the name of a person whom one knows as an individual: he observes that, 'Any proper name, such as John Smith, is almost without meaning *until we know* the John Smith in question'; and he would be quite ready to admit that, *prior to personal acquaintance*, a Proper Name can give no guidance whatever as to its own application, since John Smith 'certainly does not

bear his name written upon his brow.' Mill, on the other hand, is thinking of the amount of information which Proper Names are capable of conveying concerning an individual, apart from special associations and personal acquaintance.

Again, often, as a matter of practice, one person in using a word may be thinking of one part of the attributes and another person of another—although they would agree in admitting the same application of the word. For instance, suppose 'The Country' is given as an essay subject to a class, one essayist in writing may be thinking of a west-country farm in summer-time: another may be thinking of the sea-side or of moors in autumn; a third may have in mind a windy hillside residence in winter. Or suppose that in a Logic Examination Paper a question is asked about 'Induction,' one candidate in answering may be thinking only of the element of Discovery which is distinctive of Induction; another may have his attention fixed upon the Methods of Proof by which Inductive Discovery is established. Or (a very common case) while one person is thinking of some particular instance or instances, another is referring to a different instance—both perhaps being right in the Application of the name, but one or both possibly referring to Attributes special to the individual case and not common to the Class. For instance, two children of different families, in using the names Home or Father, may each unintentionally be crediting a whole class with a combination of Attributes more or less unique, more or less special to his own particular circumstances—and the case of the one may differ to any extent from that of the other. Probably it is Technical Names—such as Polypodium, Scarlet Fever, Predicable, Oxygen—which are least subject to ambiguity, whether of Application or Signification. Without appealing to context—even regarding them detached from assertion (as in the columns of a dictionary), we feel little doubt about their meaning.

Experiment seems to show that the 'mental equivalents' which actually occur to people's minds in using names differ quite extraordinarily in different cases. Take such a word as *Animal*, for instance. The idea corresponding to the word must be in *some* respects similar in the minds of all those who understand its Application and Signification. But in addition to this common element, it will call up in one person's mind the name simply printed, or written in a particular handwriting, or printed on the outside of a particular book; or it may call up the image of a 'picture alphabet' with illustrations of animals, or some story of animal intelligence, or a pet animal, or the first animal one cared for, or the cat of the house, or an idea of the movements made in speaking the word, or some striking delineation of an animal seen in a magic-lantern exhibition or a picture gallery, or Noah's ark, or a mere shapeless moving mass. If one dwells upon the word, an immense

succession of ideas may occur to one; in rapid reading or speaking, perhaps only one or two. What seems very often to happen in the latter case is, that one just thinks very transiently of the word itself, with a satisfactory, though evanescent, consciousness of understanding its meaning and application. If in reading or listening one meets a word of which one does not know the meaning, one is instantly arrested by a feeling of dissatisfaction, due to the recognition of a hindrance to comprehension. As an illustration of what I mean, I may refer to what happens when, in looking rapidly through a passage in some tolerably familiar language with a view to translating it, one comes here and there upon words of which one does not know the meaning. The translator, the moment he sees the other words, and without any pause to realise their full import, is aware that he knows their signification; and he is aware, just as instantaneously, that he does *not* know the meaning of the strange words.

What perhaps happens often to some people, in connection with Common and Proper Names, is that these call up in the mind a kind of 'generic image.' *E.g.* the word *horse* may suggest a sort of vague image, like a horse seen at a little distance in a fog, which is definite enough not to be mistaken for any other creature, but not definite enough to be identified as of this or that breed, colour, size, etc., much less as a definite individual; *quadruped* may suggest merely four vague elementary legs, supporting an elementary body, like a child's drawing—and so on. Our image of many acquaintances, and even friends, may be very vague—just definite enough to enable us to know them when we see them, but by no means definite enough to enable us to accurately draw or describe them, or perhaps even to say by what sign or signs we recognise them.

Butler (Sermon I., note 2) puts the case of a man whom he supposes to 'go through some laborious work, upon promise of a great reward, without any distinct knowledge what the reward would be.' The state of this man's mind with reference to the reward must, I imagine, correspond in essentials with the state of mind of a person dwelling on a Common Name withdrawn from context: but of course names ordinarily occur to us with a context which helps to determine their mental equivalent.[1]

[1] In this and some other Sections I have taken passages from my *Elements of Logic*.

SECTION XVIII.

FALLACIES.

CONFUSION is often a *source* of Fallacy, but it cannot be said that Confusion *is* Fallacy, because in as far as there is confusion, it is doubtful what our propositions really are or mean. This confusion may be (*a*) because of the ambiguity of some Term or Term-constituent (Term-name or Term-indicator). Fallacy produced by the use of Question-begging Epithets seems to come under this head. For instance, the words *business-like, orthodox, inartistic, un-English,* are often used in a question-begging way; the reason being that besides the actual signification of the names, they carry a vague implication of praise or blame, and upon this implication there may be based an explicit condemnation or approbation which the term itself either does not justify in any way at all, or only justifies in a circular and tautological fashion —thus 'begging the question.' Again (*b*) confusion may be due to ambiguity of construction. Or (*c*) to ambiguity of context or implication. What is called the Fallacy of Continuous Questioning may be refer-

rible to confusion of this third sort. *E.g.* if I ask, 'Is what you are thinking of over 1 lb. in weight?' the difficulty to the person questioned of framing an answer, if his 'object' is without weight, is due to what may be called ambiguity of implication or reference, for there is no ambiguity in the *terms* or *construction* of my question. 'Why does a dead fish weigh more than a living one?' is another and familiar instance of a fallacious question. In these cases it appears to be assumed that the conditions exist which are necessary in order to make the question such as is capable of receiving a valid answer, without involving an answer to some other question as well—when, as a matter of fact, this may not be so. In other cases of Fallacious Questioning, the fallacy (in as far as there is fallacy) may be due to ambiguity of construction; *e.g.* Are you ready and willing? Have you read *Robert Elsmere* and *John Ward, Preacher*? Are Billy and Colin at school?

Fallacies of Equivocation are Fallacies due to ambiguity of Terms; Fallacies of Amphibology are due to ambiguity of Construction. The Fallacies of Composition (concluding of the whole what has been asserted of constituents), Division (concluding of part what has only been asserted of the whole), Accident (arguing from a general rule to a special case—*A dicto simpliciter ad dictum secundum quid*), the Converse Fallacy of Accident (arguing from a special case to a general rule—*A dicto secundum quid ad dictum simpliciter*),

and the Fallacy of arguing from one special case to another special case, are all Fallacies of Equivocation. When the confusion to which such Fallacies are due has been pointed out, they generally appear at once as Eductive Fallacies of Redundant Terms, or as Syllogistic Fallacies of Redundant Terms.

"If a person were to argue that his ailment is a cold, and that all cold is dispelled by heat, therefore his cold will be dispelled by heat," he would fall into a simple Fallacy of Equivocation—*cold* being taken in two different meanings. "Members of trades-unions often fall into" a Fallacy of Composition. "They argue that stone-masons, by limiting the number of apprentices, may raise their own wages; carpenters can do the like; and also brickmakers, engineers, cotton-spinners, and so on through the whole list of trades. It is quite true that any one trade may do so to a certain extent; but it does not follow that all trades taken together can do it, because each trade, in thus raising its own wages, tends to injure the others in some degree." Again, "we sometimes fall into the opposite fallacy to that last described, and argue that, because something is true of the whole of a group of things, therefore it is true of any of those things. . . . All the soldiers in a regiment may be able to capture a town, but it is absurd to suppose that therefore every soldier in the regiment could capture the town single-handed." (*Cf.* Jevons, *Primer of Logic*, pp. 114, 117, 118.) This is the Fallacy of Division. To

argue that because whoever intentionally kills another ought to suffer death, therefore a soldier who kills an enemy in battle ought to suffer death, is to fall into the Fallacy of Accident. To argue that because almsgiving in certain cases is productive of harm, therefore no aid should ever, under any circumstances, be given to persons in pecuniary distress, is to commit the Converse Fallacy of Accident. In all these cases we find that we have no true Middle Term, because the ostensible Middle Term is really not the same in the two Premisses.

Again, the Fallacy commonly called *Non-Sequitur* sometimes reduces to a Fallacy of Redundant Terms (1) in the Premisses (which reduces to a case of no true Middle Term), (2) in Premisses and Conclusion. *E.g.*

(2) The sea was the place where the incidents of my story occurred;
There is the sea;
Therefore my story is true.

Here the Terms of the Conclusion are not the Major and Minor Terms of the Premisses.

The Fallacy of the False Cause (*A non Causa pro Causa, Post hoc ergo propter hoc*) reduces to an Eductive Fallacy of Redundant Terms ('Simple Conversion of an A Proposition'). *E.g.*—

Whatever is cause of X precedes X;
∴ Whatever precedes X is cause of X.

"I walk under a ladder and lose the train just afterwards. Foolishly I attribute my misfortune, not to my unpunctuality, but to the ill-luck resulting from going under a ladder. A ship sails on a Friday and is shipwrecked, and one of the passengers blames his folly in starting on an unlucky day." (R. F. Clarke, *Logic*, p. 454.)

The Fallacy of Irrelevant Conclusion is reducible to an Eductive Fallacy of Discontinuity (*cf. post*, p. 185). *E.g.* a person who, wishing to prove that *S is Q*, argues as follows—

$$\begin{array}{c} \text{M is P} \\ \underline{\text{S is M}} \\ \text{S is P} \end{array}$$

and offers this argument in support of the assertion *S is Q*, commits the Fallacy of Irrelevant Conclusion (*Ignoratio Elenchi*). He proves a Conclusion other than that required to be proved. What is implied in this procedure is, that *because S is P, therefore S is Q*. When thus barely stated, the illicit nature of the inference is at once apparent. To such a case the rules of Eduction in Section x. will not apply. For further illustration, take the cases of the persons in *Punch* who proved that they (1) were not Toxopholites, and (2) did belong to the Psychical Society, by showing (1) that they belonged to the Church of England, (2) that they had been practising on their brothers' bicycles.

The Fallacy known as *Argumentum ad populum*, comes under the head of *Ignoratio Elenchi*. "The skilful barrister will often seek to draw off the attention of the jury from the real point at issue, viz. the guilt or innocence of the prisoner, by a pathetic description of the havoc that will be wrought in his home if he is convicted, or by seeking to create an unfair prejudice against prosecutor or witnesses." (Clarke, *Logic*, p. 448.)

Since Fallacy consists in either identifying what is different, or differencing what is identical, we get a primary subdivision of Fallacies into (*a*) those of *professed Difference*, which may be called Fallacies of Tautology; (*b*) those of *professed Identification*, which may be called Fallacies of Discontinuity. (*a*) Embraces all such Fallacies as *Circulus in Definiendo, Petitio Principii*, Arguing in a circle.

Fallacy in the broadest sense may perhaps be defined as—The assertion or assumption of some relation between (1) Terms, or (2) Propositions, which does not hold between them. (1) are not generally treated among logical Fallacies, though they are included by Mansel (Mansel's *Aldrich*, Note M) as Fallacies of Judgment. It would be convenient to call them Elemental Fallacies. All combinations of words which (i.) cannot be significant, or (ii.) cannot be true, would come under this head. *A is A* would be a case where compatibility between the Terms merges into complete Tautology. Circular Definitions would

also come under this head—*e.g.* Genus is the material part of Species (Species being a subdivision of Genus); *Some* means *not-none* (*none* being in turn defined as meaning *not-some*). *A is not-A* would be a case of (ii.)—the case where diversity merges into absolute incompatibility (or discontinuity).

Taking Fallacy in this wide sense, it appears that breaches of the common rules of Definition, Division, and Classification generally, are included. *E.g.* in Circular Definitions and Cross Divisions, we have Tautology; breaches of the rule that the sum of constituent Species is equal to the Genus, or of the rule that the definition must be exactly equivalent to the Species defined, may be exhibited as Fallacies of Discontinuity. But if Fallacy is understood in the narrower sense, it may be defined as follows:—There is Fallacy whenever we conclude from one or more Propositions to another, the conclusion not being justified by the premiss or premisses.

This must be understood to include the cases (Tautological) in which a Proposition, which professes to be a conclusion, simply repeats the datum or a part of it, or claims to be proved by the help of an assertion which the professed conclusion has itself contributed to prove—for clearly a Proposition can be no justification for itself.

Where fallacious Inference is from *one* proposition to another, there is a Fallacy of Immediate Inference (or Eduction); where it is from two propositions taken together to a third, there is a Fallacy of Mediate Inference. There are, besides, certain Tautologous Fallacies which involve relations between a plurality of Arguments.

FORMAL FALLACIES OF IMMEDIATE INFERENCE (OR EDUCTION).

These may be divided into *Eversive* and *Transversive* Fallacies. Eversive Fallacies may be (I.) Categorical; (II.) Inferential; (III.) Alternative.

(I.) Here we may (1) pass from one proposition to another when the two propositions have no Term or Term-name in common—*e.g.* from *M is N* to *Q is R*. This is not a common form of Fallacy. It may be called an Eductive Fallacy of Four Term-names. (2) Or we may pass from one proposition to a second proposition which (*a*) contains one Term-name not contained in the first proposition; or (*b*) a Term having a wider application than the corresponding Term in the first proposition—*e.g.* (*a*) All R is Q, ∴ Some X is Q; (*b*) Some R is Q, ∴ All R is Q (or All Q is R).

(3) Or we may profess to educe a proposition from itself—to infer *S is P* from *S is P*.

(II.) Inferential Fallacies of Eduction. Here, besides Tautological Fallacies, in which it is professed to educe a proposition from itself, we may instance two Fallacies of Discontinuity which, from their correspondence with the Syllogistic Inferential Fallacies,

might be called the Fallacy (*a*) of the Antecedent, (*b*) of the Consequent.

E.g. (*a*) If E is F, G is H;
∴ If E is not F, G is not H.

(*b*) If E is F, G is H;
∴ If G is H, E is F.

(III.) Alternative Fallacies of Eduction. Here, besides Tautological Fallacies, numerous Fallacies of Discontinuity are possible.

E.g. (1) All R is Q or T;
∴ No R is Q and T.

This is a Fallacy of denial.

(2) Any R is Q or T;
∴ Any Q or T is R.

This is a Fallacy of conversion.

(3) Some R is Q or T;
∴ Any R is Q or T.

This is a Fallacy of enlargement.

(4) G is H or E is not F;
∴ G is not H or E is F.

This corresponds to the Inferential Fallacy of the Antecedent.

Transversive Fallacies occur in passing from Categorical to Inferential or Alternative Propositions, from Inferentials to Categoricals or Alternatives, and from

Alternatives to Categoricals or Inferentials. All Transversive Fallacies are Fallacies of Discontinuity.

FORMAL FALLACIES OF MEDIATE INFERENCE.

Syllogistic (like Eversive) Fallacies fall into the three subdivisions of (I.) Categorical; (II.) Inferential; (III.) Alternative.

(I.) In I. we have either (i.) the case where *no* conclusion is inferrible; or (ii.) the case where the proposition, which is professedly inferred, is not inferrible, though *some* conclusion is inferrible—including the case (tautological) where the proposition professedly *inferred* is simply a repetition of one of the premisses, or asserts *part* of what is asserted by one of the premisses.

(i.) All cases here are reducible to cases (A) of Tautology, (B) of no true Middle Term in the Premisses, or (C) of Inconsistent Premisses.

In (A) one premiss repeats the other, (*a*) wholly, or (*b*) partly. *E.g.*

(*a*) M is P
M is P

(*b*) All R is Q
Some R is Q.

In (B) where there is no true Middle Term in the Premisses, we have (*a*) the case of four Term-names. (The Fallacy of Non-Sequitur may come either under this head or under (ii.) (β), cases in which the third proposition which is inferred is not inferrible, though some conclusion is inferrible.) Then

(*b*) if the Term-name of the Middle Term is a class-name qualified by *Some*, the *Some N* of one premiss may be, for all we know, quite different in application from the *Some N* of the other premiss. (*Some N* is ambiguous on account of the indeterminateness of *Some*.)

(*c*) If the Term-name of the Middle Term is ambiguous, again, for all we know, it may be a different Term in the two premisses.

And the only case where from two negative premisses it is impossible to infer some conclusion, is the case where these premisses cannot be reduced to *affirmative premisses* having a true Middle Term—that is, having three Terms, or four Terms, *one of which is included in one of the others.* For instance,

$$\left.\begin{array}{l}\text{No N is Q}\\ \text{No R is N}\end{array}\right\}\text{ reduces to }\left\{\begin{array}{l}\text{All N is not-Q}\\ \text{All N is not-R}\end{array}\right.$$

and

$$\left.\begin{array}{l}\text{No N is Q}\\ \text{Some N is-not R}\end{array}\right\}\text{ reduces to }\left\{\begin{array}{l}\text{All N is not-Q}\\ \text{Some N is not-R}\end{array}\right.$$

both formally justifying the conclusion

Some not-R is not-Q.

But from

$$\left.\begin{array}{l}\text{Some N is not Q}\\ \text{Some R is not N}\end{array}\right\}\text{ (1)}$$

no conclusion can be obtained.

Again, from

$$\left.\begin{array}{l}\text{Some N is not Q}\\ \text{Some N is not R}\end{array}\right\}\text{ (2)}$$

from

$$\left.\begin{array}{l}\text{Some N is not Q}\\ \text{Some N is R}\end{array}\right\}\text{ (3)}$$

and from

$$\left.\begin{array}{l}\text{Some N is Q}\\ \text{Some N is not R}\end{array}\right\}\text{ (4)}$$

we can draw no conclusion—because *Some N* is ambiguous, and we do not know that we have a true Middle Term.

From two (indefinite) particular affirmative premisses, for the same reason, we can draw no conclusion.

From a particular (indefinite) Major and a negative Minor, we can (indirectly) get a conclusion—*e.g.*

$$\left.\begin{array}{l}\text{Some N is Q}\\ \text{No R is N}\end{array}\right\}\text{ reduces to }\left\{\begin{array}{l}\text{Some N is Q}\\ \text{All N is not-R}\end{array}\right.$$

which gives the formally valid conclusion

Some not-R is Q.

And from premisses with a negative Minor in Fig. 1, we can get a conclusion by reducing to Fig. 3. *E.g.*

$$\left.\begin{array}{l}\text{All N is Q}\\ \text{No R is N}\end{array}\right\}\text{ reduces to }\left\{\begin{array}{l}\text{All N is Q}\\ \text{All N is not-R}\end{array}\right.$$

and gives the formally valid conclusion,

Some not-R is Q.

(C) In the case of Inconsistent Premisses we may have a true Middle Term, but the extremes are the negatives of each other. *E.g.* P is M, M is not-P.

(ii.) Here we have cases in which the third proposition professedly inferred is not inferrible, though some other proposition is inferrible.

Under this head come the Fallacies of

(α) Tautology. *E.g.*—

M is P
S is M
M is P. (5)

(β) Non-Sequitur. *E.g.*—

All N is Q
Some R is N
No R is Q (6)
(or, All X is Y, etc.).

(In all cases of (ii.) except (α), the whole syllogism contains redundant Terms—that is, it contains more than three Term-names, or some Term in the conclusion is wider than the corresponding Term in the premisses.)

(γ) Illicit Major and Minor. *E.g.*—

All N is Q
Some R is N
All R is Q. (7)

Some Q is not N
All R is N
No R is Q. (8)

(The conclusion *Some Q is not R* is valid.)

In these two cases we conclude to a Term of which part (R *minus* Some R, Q *minus* Some Q) may be not coincident with any part of the corresponding Term in the premisses.

(δ) Negative Conclusion from Affirmative Premisses. *E.g.*—

All N is Q
All R is N
No R is Q.

Again, we do not know whether the distributed Q of the Conclusion is wholly coincident with the [some] Q of the Major Premiss.

(ϵ) Affirmative Conclusion from a Negative Premiss. *E.g.*—

No N is Q All R is N All R is Q.	This reduces to	All N is not-Q All R is N All R is Q.

(Four Term-names.)

All the Categorical Fallacies of Syllogism pointed out above are excluded by the Canon of Syllogism put forward in Section XII. ['If the Application of any two Terms is identical (or distinct), any third Term which has a different Term-name, and is identical in

Application with the whole (or part) of one of those two, is also (in whole or part) identical with the other (or distinct from it).'] For instance (1) and (2) are incompatible with that part of it which indicates that there must be Identity between two of the Terms.

For in (1)—

Some N is-not Q
Some R is-not N—

if we take either Q or Some R as a third Term, we cannot say that it is identical in application with the whole (or a part) of any other Term in the two premisses.

Similar objections apply to (2)—

Some N is-not Q
Some N is-not R.

And again, in (3), of neither of the premisses can it be said that one of its Terms is identical (in whole or part) with either Term of the other premiss, since *Some N* is ambiguous. And the same holds of (4).

(5) is not in accordance with the condition indicated by the last clause of the Canon (and referring to the conclusion), that 'the Application of any *third* Term . . . is also identical (or distinct) in whole or part, with the Application of *the other*' (*i.e.* with that other which is not a Middle Term).

In (6), (7), (8), etc., a Term is introduced in the conclusion of which it cannot be said that its whole

application is either identical with, or a part of, the application of any Term in the premisses.

II. *Fallacies of Inferential Syllogism.*

These fall under four heads, corresponding to the division of Inferential Syllogisms into

(i.) Pure Hypothetical
(ii.) Pure Conditional
(iii.) Hypothetico-Categorical
(iv.) Conditio-Categorical
} Syllogisms.

Besides Tautological Fallacy which occurs under each head, the Fallacies incident to (i.) appear to be of two kinds. (1) Where the premisses are such that *no* conclusion can be drawn. When this is the case, there is no such connection between the two premisses that a third proposition (having elements in common with both premisses) can be inferred from them. *E.g.*

If K is L, F is G;
If D is E, M is N;

If A is B, C is D
If C is D, A is not B.

(2) Where the conclusion drawn is not deduced from the premisses, though some other conclusion is deducible. *E.g.*—

If K is L, F is G;
If D is E, F is not G;
If K is not L, D is E.

If K is L, F is G;
If D is E, F is not G;

If D is E, M is P.

(If K is L, D is not E may be deduced.)

If K is L, F is G:
If F is G, D is E:

If D is E, K is L.

(The consequence, If D is not E, K is not L, is deducible.)

(ii.) Fallacies of Pure Conditional Syllogism.

In as far as Conditional Propositions are similar to Hypotheticals, the Fallacies under this head may be classed with those under the preceding head. In as far as they are similar to Categoricals, Conditional Fallacies may be classed as Categorical.

(iii.) and (iv.) Fallacies of Hypothetico-Categorical Syllogism, and of Conditio-Categorical Syllogism have corresponding subdivisions. They include Tautological Fallacies and Fallacies of Discontinuity. The chief Fallacies of Discontinuity are two—namely (1) the Fallacy of the Antecedent (2) the Fallacy of the Consequent. *E.g.*

(1) If D is E, F is G;
D is not E;

F is not G.

If any D is E, that D is F:
This D is not E;

This D is not F.

(2) If D is E, F is G;
F is G;

D is E.

If any D is E, that D is F;
This D is F;

This D is E.

Fallacy here may be due also (3) to the presence in the Minor Premiss of a constituent not included in the Major Premiss, thus rendering it impossible to draw any conclusion. And (4) it may be due to the presence in the Conclusion of a constituent not contained in the premisses—the Conclusion thus being invalid.

III. *Fallacies of Alternative or Disjunctive Syllogism.*

In Pure Alternative Syllogisms we have Fallacies of Tautology—

(1) In the Premisses alone. *E.g.*—

A is B, or C is D;
C is D or A is B.

(2) In concluding from valid premisses when (*a*) the Conclusion is the same as a premiss. *E.g.*—

(*a*) A is B or C is D;
E is F or A is not B;

A is B, or C is D.

(*b*) The Conclusion asserts part of a premiss. *E.g.*—

(*b*) C is not D or E is F;
Any A is B or C is D:
———
Some A is B, or C is D.

We may have Fallacies of Discontinuity—

(1) In the premisses, when the premisses are not connected by means of an alternative of which the affirmative occurs in one premiss, and the negative in the other (the remaining alternatives being different from one another). *E.g.*—

A is B or C is D
E is F, or G is H.
———
A is B or C is D
C is D or G is H.
———
A is B or C is D
A is B or C is not-D.

(2) In passing from premisses to conclusion, when the alternatives of the conclusion are not the extremes of the premisses. *E.g.*—

C is D or A is not N
E is F or C is not D
———
K is H or L is M.

The Fallacies of Discontinuity which are most obviously possible in what I have called Categorico-Alternative Syllogisms, are

(1) The introduction into the Minor Premiss of an

element distinct from those contained in the Major Premiss—in which case no inference is possible.

(2) The introduction into the Conclusion of an element not contained in the Premisses—in which case the Conclusion is unjustifiable.

(3) The Fallacies corresponding to the Inferential Fallacies of Antecedent and Consequent.

Again, in Fallacies of Inferentio-Alternative Syllogism, there may be Fallacy due to the unwarrantable introduction of a fresh element, (1) into the Minor Premiss, (2) into the Conclusion; but the chief Fallacies are those of Antecedent and Consequent (as in the case of Inferentio-Categorical Fallacies). With both kinds of Alternative Syllogism, Tautological Fallacies may occur.

CIRCULAR FALLACIES.

Besides Elemental, Eductive, and Syllogistic Fallacies, there are the Fallacies that occur when, in the attempt to prove an assertion, recourse is had to some proposition which that assertion itself has contributed to prove—which Fallacies involve relations between a plurality of Syllogisms.

The name Circular Fallacies may be conveniently appropriated to these. They occur in the simplest form when there are only two Syllogisms concerned, but may (and often do) involve relations between several Syllogisms.

The following are examples. Taking the Syllogism

Q is P
M is Q
M is P

it may be required to prove M is Q. If this is done by means of the Syllogism

P is Q
M is P
M is Q

we have a case of circular reasoning.

Or if we have the Hypothetical Syllogism

If G is H, K is L
If E is F, G is H
If E is F, K is L

and proceed to prove the Minor Premiss by the following argument—

If K is L, G is H
If E is F, K is L
If E is F, G is H

we have again a case of arguing in a circle.

Again, taking the Syllogism

If Jack is a good boy, he will do what he is told;
He is a good boy;
He will do what he is told,

if we go on to prove the Minor Premiss by the following Syllogism—

If Jack will do what he is told, he is a good boy;
Jack will do what he is told;
He is a good boy,

we have committed a Circular Fallacy.

RELATIVE FALLACIES.

In this Section we have, so far, been concerned with Formal Fallacies—that is, Fallacies that may occur in dealing with Absolute or Non-relative Propositions. There are also, of course, Relative Fallacies both of Mediate and of Immediate Inference—that is, Fallacies that can only occur in dealing with Relative Propositions. These, like Formal Fallacies, may be either Tautologous or Discontinuous; and they may all be reduced to breaches either of the Principle of Transformation, or of the Canon of Relative Mediate Inferences. (*Cf.* pp. 99 and 132.)

TABLE XI.

FALLACIES.

- *Elemental F.*
  - *Tautologous F.*
  - *Discontinuous F.*
- *Eductive F.*
  - *Formal* or *Absolute F.*
    - *Tautologous F.*
    - *Discontinuous F.*
      - *Eversive F.*
        - *Categorical F.*
        - *Inferential F.*
        - *Alternative F.*
      - *Transversive F.*
  - *Relative F.*
- *Fallacies of Mediate Inference.*
  - *Absolute (Formal) F.*
    - *Tautologous F.*
      - *Categorical F.*
      - *Inferential F.*
      - *Alternative F.*
    - *Discontinuous F.*
  - *Relative F.*
- *Circular F. (Tautologous).*

TABLE XII.

FORMAL FALLACIES WITH CATEGORICAL PROPOSITIONS (EDUCTIVE AND SYLLOGISTIC FALLACIES).

- *Eductive Fallacies.*
  - *Fallacies of Tautology.*
    E.g.—
    R is Q ;
    ∴ R is Q.
  - *Fallacies of Discontinuity (Redundant Terms).*
    E.g.—
    M is N ; } All R is Q ; }
    ∴ Q is R. } ∴ Some S is Q. }
    Some R is Q ; } Some S is not P ; }
    ∴ All R is Q. } ∴ Some P is S. }
- *Syllogistic Fallacies.*
  - *Fallacies of Tautology.*
    (*a*) In Premisses : *e.g.*—
    All R is Q } All AB is CD }
    Some R is Q } All CD is AB }
    (*b*) In Conclusion : *e.g.*—
    All R is N
    All N is Q
    All R is N.
  - *Fallacies of Discontinuity.*
    - *No Conclusion inferrible (no true Middle Term).*
      - *Inconsistent Premisses.*
        E.g. M is P }
        P is not M }
      - *Redundant Term in Premisses.*
        - *Four Term-names.*
          E.g.—
          All Q is N }
          All R is T }
        - *Undistributed Middle (a particular case of no True Middle Term).*
          E.g.—
          Some N is Q }
          Some N is R }
        - *Term-name of Middle Term Ambiguous.*
          E.g.—
          All angels are good spirits
          All angels are worth ten shillings
          Some good spirits are worth ten shillings.
    - *Some Conclusion inferrible, but not the one inferred (Redundant Term in Premisses + Conclusion).*
      - *Illicit Major.*
        E.g.—
        All N is Q
        No R is N
        No R is Q.
      - *Illicit Minor.*
        E.g.—
        No Q is N
        Some R is N
        No R is Q.
      - *Negative Conclusion from Affirmative Premisses.*
        E.g.—
        All N is Q
        All R is N
        No R is Q (or All R is not-Q).
      - *Affirmative Conclusion with a Negative Premiss.*
        E.g.—
        No N is Q
        All R is N
        All R is Q
        (reduces to All N is not-Q
        All R is N
        All R is Q).
      - *Fresh Term-name in Conclusion.*
        E.g.—
        All N is Q
        All R is N
        All R is K (or Some F is G, etc.).

SECTION XIX.

PRINCIPLES AND CATEGORIES OF LOGIC.

We have now to consider what the Principles are which may be regarded as the foundations of Logic—that is, the Principles which are involved, whether explicitly or implicitly, in making assertions, and in putting them together. Logic, as we have seen in the preceding Sections, is concerned with statements or propositions—that is, assertions or judgments expressed in language—and with the various relations between such expressed judgments. A thought must be formulated before it can be entitled to be called a judgment, and a judgment must be expressed before it can become the subject of logical discussion and investigation.

The fundamental form of Proposition is the Categorical (*cf.* pp. 55, 56); hence it would appear that we need, in the first place, a Principle of Categorical Assertion. Now, we saw in Section III. that what every Categorical Proposition affirms or denies is Identity in Diversity; hence the principle which we

are seeking must be a Law of Identity in Diversity. This may be expressed as follows:—

> Everything which can be thought of or named is an Identity in Diversity—(a Diversity of interdependent characteristics).

This implies that every nameable thing has a plurality of characteristics, and may be referred to by more than one name; hence that any name may be the Subject of a Categorical Proposition of the form *S is P*. It implies further, that in order that anything should be regarded as having a character of its own, as being one thing rather than a multiplicity of things, its characteristics must be regarded as interdependent—for interdependence of characteristics seems inseparable from Identity.

The Law of Identity in Diversity may be represented by the symbolic statement

A is B.

It seems clear that nothing can be thought of except as having (1) plurality of characteristics, (2) interdependence of characteristics, (3) permanence. Hence no object can be named which is not regarded as an Identity more or less perduring in a Diversity of interdependent characteristics. Indeed, permanence itself involves Identity in Diversity, for whatever is permanent, is permanent amid change; and though a thing which has permanence is the *identical* thing at the end of its duration that it was at the begin-

ning, it is also *diverse*, because at least its *time-characteristics*, and all that they imply, have undergone alteration.

Further, anything that we can think of has to be thought of not only as being itself a something, but also as connected with all other somethings, as being itself a part of the universe. As every thing by itself must be thought of as an Identity in Diversity, so every thing as a constituent of the world, as a member of the system of connected things to which it belongs, must be thought of as related to every other member of that system and to the whole. Therefore, not only may anything be called by more names than one, but it may actually be called by any one of the innumerable multitude of names which express the innumerable multitude of relations (positive and negative) to other things (Subjects or Attributes) which are among its characteristics (*cf.* Law of Excluded Middle). Consider, *e.g.*, the mathematical relations of a Conic Section to other geometrical figures: or the relation of any individual man to his ancestors and their descendants; or the relation of any moment to the rest of time, or of any position in space to any and all other positions in space, etc.; of one thought of any mind to the other thoughts of that mind; of any quantity or colour to other quantities, colours, etc.

Moreover, the idea of a world or system, a whole of connected parts, seems to involve *uniformity* of interdependence between characteristics. Not merely is

this both true of the world as we know it, and implied in existing language (without it, *e.g.*, Common Names would cease to be important or even possible), but it seems as impossible to think of a world without this uniformity, or of an absence of such uniformity in given cases, as to think of any single thing that is not an Identity in Diversity.[1]

In a whole that is made up of parts, there must be Similarity in Otherness. *Absolute* Dissimilarity of any two things is as completely unthinkable as absolute Similarity of two things, and *this* is a contradiction in terms. If absolutely dissimilar. things could not be compared; if absolutely similar, they could not be distinguishable—would, in fact, be not *two* but *one*. And further, Similarity between any two things *in one point only* is not thinkable; hence on this line of thought again we are led to the conclusion that in any connected whole there must be uniformity of interdependent characteristics. I hold that the reason why Similarity between any two things in one point only is not thinkable, is that every characteristic must be thought of as having (in Bacon's phrase) its *Form*—that is, an accompaniment which

[1] In the case of organic things as known to us, the stability of nature of an individual thing, and uniformity of co-existent characteristics in distinct things, seem bound up together. For instance, it is inconceivable that the seed of any plant should develop into a different plant—as an acorn into an elm, or mignonette seed into candytuft—or the egg of one kind of bird hatch into another kind of bird—as the egg of a robin into a linnet.

is inseparable in any given case, and uniform in all cases.

The Law of Identity in Diversity appears, on reflection, to have the characteristic of self-evidence. But in any case its acceptance is a necessary condition of the acceptance of Propositions which are, at first sight, self-evident—*e.g.* Mathematical Axioms and the Law of Contradiction. We cannot even state any of these self-evident propositions, except in dependence on the Principle of Identity in Diversity. For instance, the following assertions—

> A whole is greater than its parts,
> If equals be added to equals, the wholes are equals,
> If A be B, A is not not-B—

would be impossible, unless each of the Terms used were the name of an object which is an Identity in Diversity. And in as far as the Principle of Interdependence asserts merely that every characteristic is accompanied by *some* other characteristic, it is involved in the Principle of Identity in Diversity (and, therefore, in the Law of Contradiction). And, as a Principle of *Uniformity*, it is also involved in the Law of Contradiction, as far as interdependence of the *presence of B* and the *absence of not-B* is concerned, and up to this point appears to be immediately self-evident. Further, Uniformity of Interdependence is, at first sight, self-evident in the case of Mathematical Inductions.

The Law of Identity in Diversity, and the axioms referred to on p. 147, may be formulated as follows:—

(1) Every thing has a plurality of interdependent characteristics.
(2) No two things have *only one* characteristic similar.[1]
(3) No two things have *only one* characteristic different.
(4) No two things have *all* characteristics similar.
(5) No two things have *all* characteristics different.[2]

The last four, as well as the first, appear to me to be, on reflection, self-evident—to carry their own evidence with them, and not to need the support of other propositions. The Principle of Interdependence is substantially a formulation of (2) and (3); and (2), (3), (4), (5), taken together amount to this: that any two things are alike in a plurality of points, and that any two things are also unlike in a plurality of points.

It is such relations of likeness and unlikeness that make it possible to group things together in classes.

[1] Among the characteristics of any thing may be a capacity of development; or of variableness in certain respects. *E.g.* many flowers and animals are variable in colour and size. But every variation of colour or size must be regarded as inseparable from other characteristics. For instance, with difference of colour go differences of molecular structure, differences in light-waves as regards heat, rapidity of vibration, and chemical action, difference of complementary colours, etc., etc.

[2] *Cf.* Index, under *Identity of Indiscernibles*, *Law of Heterogeneity*, *Law of Homogeneity*.

The Law of Contradiction—

A Proposition and its Negative (whether Contrary or Contradictory) cannot both be affirmed; or,

If A is B, A is not not-B—

is by some logicians regarded as the most fundamental of all logical principles. This, as we have seen, it is not, and cannot be; but it may perhaps be admitted to be that which is most directly serviceable in dealing with the *connections* of propositions. A recent writer (Mr. Richard F. Clarke, S.J., *Logic*, pp. 34, 35) says that "on this Principle of Contradiction all proof is based, direct and indirect. . . . It is a necessity of our reason. He who refuses to acknowledge its universal supremacy commits thereby intellectual suicide. He puts himself outside the class of rational beings. His statements have no meaning. For him, truth and falsity are mere words. According to him, the very opposite of what he says may be equally true. If a thing can be true and false at the same time, to what purpose is it to make any assertion respecting any single object in the universe? Fact ceases to be fact, truth ceases to be truth, error ceases to be error. We are all right and all wrong. What is true is false, what is false is true. Statement and counterstatement do not in the least exclude one another. What one man denies, another man may assert with equal truth; or rather, there is no such thing as Truth at all. Logic is a Science, yet not a Science. The Laws of Thought are universal, yet not universal. Virtue is to be followed, yet not to be followed. I exist, yet I do not exist. There is a God, yet there is no God. Every statement is false and not false, a lie yet not a lie. It is evident that the outcome of all this can be nothing else than the chaos of scepticism pure and simple—a scepticism, too, which destroys itself by its own act. If the Law of Contradiction can be set aside in a single case, all religion, all philosophy, all truth, all possibility of consequent thinking disappear for ever."

The Law of Excluded Middle may be expressed as follows:—

A Proposition and its formal Alternative (whether Contradictory or Sub-contrary) cannot both be denied; or,

A is B, or A is not B.

The Law of Identity in Diversity may be regarded as the Principle of the possibility of Significant Assertion, the Law of Contradiction as the Principle of Consistency, and the Law of Excluded Middle as a Principle of Alternation or Completion.

To the above Principles must be added as a Principle of Induction the Law of Interdependence, with its two branches, the Law of Concomitance of Characteristics, and the Law of Causation of Events. (The close connection of these latter with the axioms of Similarity and Dissimilarity has been spoken of above.)

We ought, also, to include here a statement which

sums up roughly the assumptions on which the Inductive Methods are based—the rule, namely, that Phenomena which are never found separate from each other (being either Co-existent, Successive, or Co-variant) are Interdependent. It is by the help of these Methods that we determine the all-important question, *What* are the characteristics which in any given case are inseparable?

All Absolute (or Non-Relative) Inference, is based entirely on the Principle of Identity in Diversity—it is because Names have Identity of Application in Diversity of Signification, that one name may not only be asserted of another in a Proposition, but also substituted for another in Inference. For instance, it is because M and P have Identical Application that I can assert

M is P;

and it is because M, P, and S have Identity of Application (in Diversity of Signification), that I am able from the Premisses

M is P
S is M

to conclude

S is P.

For Relative Inference, however, we require also Principles of Interrelation—the Principles, namely, that (1) All Interrelation is reciprocal, (2) Any objects that are related indirectly or mediately, are also related directly. (1) enables me to infer that if A is related to B, then B is related to A; (2) justifies me

in concluding that if A is related to B, and B is related to C, then A is related to C.

Finally, the Principle of Self-Evidence—What is self-evident ought to be believed—appears to be the most absolute and ultimate of all logical principles.

CATEGORIES OF LOGIC.

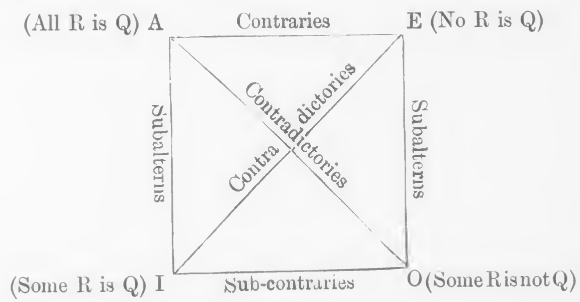
The fundamental Category of Logic is Unity in Difference (taking *Unity* to include both Identity and Similarity, *Difference* to include both Dissimilarity and Numerical Distinctness). Most of the wide notions chiefly used in Logic come under this head. Every thing spoken of is an Identity in Diversity; every Categorical Proposition is an affirmation or denial of Identity in Diversity. In Substance and Attribute, Existence and Character, in Interdependence (Concomitance—Causation), in Alternation, in all Inference, we have Identity in Diversity. Quantity is an Attribute of Substances, a mere Quality among other Qualities, and the action and passion and change of any Substance is among its Attributes; all Relation is Unity in Difference; the Category of Classing, and of Inductive (in as far as distinguished from Deductive) Inference is Similarity in Otherness; Classification and Systematisation involve the three kinds of Unity in Difference, namely, Identity in Diversity, Similarity in Otherness, the Unity of Whole and Parts; all Fallacy is reducible to mistaken assertion of Identity or Distinctness.

NOTES.

I.

'OPPOSITION' OF PROPOSITIONS.

Categorical Propositions which have the same Subject-name and the same Predicate-name, but differ in Quantity or Quality, or in both Quantity and Quality, are technically said to be *opposed* to each other. This Opposition of propositions is illustrated by the ancient diagrammatic device called the Square of Opposition, which is represented below.



A and E are called Contraries
I ,, O ,, Sub-contraries

A and I } are called Subalterns
E „ O }

A „ O } „ Contradictories.
E „ I }

Contraries cannot both be true, but may both be false.

Sub-contraries cannot both be false, but may both be true.

Contradictories cannot both be true, and cannot both be false.

Of Subalterns, if the Universal is true, the Particular is true; if the Particular is false, the Universal is false.

Contraries differ in Quality but not in Quantity.

Sub-contraries differ in Quantity but not in Quality.

Contradictories differ in both Quantity and Quality.

It is only Categoricals, and of them only *Class* Categoricals, that are contemplated in the traditional doctrine of Opposition, and the illustrative Square.

II.

THE PREDICABLES.

The Predicables are a classification of Predicates considered in relation to their subject-names. The ancient doctrines of Predicables were connected with what is called the Realist hypothesis—the view, that is, that there is in nature a system of Universals corresponding to every general (or class) notion, and entering into the composition of each member of a class —membership of the class depending upon participation in the corresponding Universal. On this view, classes are discovered by man, not made by him, and an Infima Species (or Lowest Class), and a Summum Genus (or Highest Class) are possible.

Aristotle adopted a four-fold division of Predicables, namely—

1. Definition.
2. Proprium.
3. Genus.
4. Accidens.

In any propositions predicating Definition or Proprium, Subject-name and Predicate-name are convertible, because they have the same application; in any Proposition predicating Genus or Accidens, Subject-name and Predicate-name are not convertible, because the application is not coincident. In (1) signification (or connotation) of Subject-name and Predicate-name are substantially similar; in (3) they are partly similar; in (2) and (4) entirely diverse.

The following propositions may be given as examples—

(1.) Man is a *rational animal.*
(2.) Man is *capable of laughter.*
(3.) Man is an *animal.*
(4.) Man is *two-handed.*

Genus means a class in which narrower classes are contained; *e.g.* the class *Animal*, which contains *Man* and *Brute* is a *Genus.*

Proprium means some quality that results from the Definition (*e.g. capacity for laughter* results from the attribute of *rationality*).

Accidens means some Attribute which belongs to the members of the class, but neither is connoted by, nor follows from, Genus or Definition. Definition expresses the *connotation of the Genus of the class defined + connotation which distinguishes that class from the other classes contained in the Genus.*

But this four-fold scheme of Aristotle's was replaced by a

later five-fold classification introduced by the Neo-platonist Porphyry in the third century. According to this account the Predicables are as follows :—

(1.) Genus.
(2.) Species.
(3.) Differentia (Difference).
(4.) Proprium (Property).
(5.) Accidens (Accident).

For of any Subject we can predicate (1) a wider containing class; (3) the differentiating attribute by which the Subject is marked off from the rest of the Genus; (2) Genus (1) + Differentia (3); (4) some characteristic which follows from the signification of (1) or (3); (5) some characteristic which belongs to the Subject, but neither follows from, nor is included in, the connotation of Genus or Differentia.

If we take the species *Man*, its Genus (as before) is *Animal*; its Differentia is *Rational* (and Genus + Differentia = Species); a Proprium is *cooking his food*; an Accident is, *smooth-skinned.* This Accident is Inseparable, because common to all men. *Having woolly hair* would be a Separable Accident of the class *Man*, because it is an Attribute of some men only. Separable and Inseparable Accidents of Individuals are also spoken of. *E.g.* it would be an Inseparable Accident of Virgil that he was born at Mantua, a Separable Accident that he is hungry or awake.

In *Plato is a man* we predicate *Species Praedicabilis.*

In *Man is an animal*, *Man* is *Species Subjicibilis.*

The whole scheme is somewhat remote from our present needs and modes of thought.

Tree of Porphyry.

This is the name usually given to a diagrammatic device attributed to Porphyry, and illustrative of the Predicables and their relation to Division and Definition. It is called

also the *Ramean Tree*, after the reforming sixteenth-century logician Ramus.

SUBSTANCE

In this diagram we start from Substance, which is the Summum Genus, the highest (or widest) class, and finish with individual members of the class Man, which is an Infima Species, the lowest (or narrowest) class that we reach in the process of subdivision. The line of ascent through the positive members of the division—*Corporeal*, Body, *Organic*, Living thing, *Sensitive*, Animal, *Rational*, to Man—is called the Predicamental Line. At each step the division is by Dichotomy (twofold division) into a class and its negative (Corporeal, Incorporeal, etc.). A division by Dichotomy is necessarily exhaustive, as (by the Principle of Excluded Middle) whatever does not belong to the positive branch must belong to the negative one. The addition to the Genus

Substance of the Differentia *Corporeal*, gives the Species *Body*. When *Body* is, in its turn, divided into *Organic* and *Inorganic*, it becomes Genus to those two Species; and so on throughout, until we reach the Infima Species *Man*, which can only be divided into individuals. *Body*, *Living thing*, and *Animal* (which are alternately Species and Genera), are called Subaltern Genera and Species. Every class is a Genus to all the classes narrower than itself; and to every class the next wider one is a Proximum Genus, *e.g.* *Animal* is the Proximum Genus to *Man*.

III.

'PERFECT INDUCTION.'

This name has been given to an argument in which a number of things are enumerated one by one in the Premisses, and summed up under a general expression in the Conclusion. The following argument is one of the examples given by Jevons of a 'Perfect Induction':—

> Mercury, Venus, the Earth, etc., all move round the Sun from West to East;
>
> Mercury, Venus, the Earth, etc., are all (=the whole of) the known Planets;
>
> Therefore all (=each of) the known Planets move round the Sun from West to East.
>
> —(Jevons, *Elementary Lessons in Logic*, pp. 214, 215.)

The syllogistic expression of the argument, as above, has been called an 'Inductive Syllogism'; but its scope is entirely different from that of the reasoning by which we arrive at a fresh generalisation or law.—*Cf. ante*, pp. 81, 84-85, 87, 136, etc.

As far as I have observed, in all the examples of 'Perfect Induction' which are given by different logicians, there is the curious flaw that the Minor Term is taken collectively in the Minor Premiss and distributively in the Conclusion.—'Perfect Induction' is also known as Aristotelian Induction, Formal Induction, Complete Induction.

IV.

ELLIPTICAL AND COMPOUND ARGUMENTS.

In ordinary speech and writing arguments are frequently not expressed at full; for instance, we constantly hear such abbreviated Syllogisms as—

(1) This fungus is a true mushroom, therefore it is good to eat.

(2) All cows are ruminants, therefore this animal is a ruminant.

(3) All bullies are hateful, and this boy is a bully.

In (1) the suppressed proposition is the Major Premiss, All true mushrooms are good to eat; in (2) it is the Minor Premiss, This animal is a cow; in (3) it is the conclusion, This boy is hateful. Elliptical arguments of this sort are frequently called Enthymemes (*e.g.* by Jevons and Whately). Where the Major is suppressed, the Enthymeme is said to be of the First Order; where the Minor is suppressed, it is of the Second Order; where the Conclusion is suppressed, it is of the Third Order.

There is an interesting correspondence between these incomplete arguments and Inferential Syllogisms of the forms—

If M is P, S is P ($\because$ S is M).
If S is M, S is P ($\because$ M is P).

(*Cf. ante*, pp. 45, 46.)

The argument which is called *Sorites* or *Chain-argument* is also enthymematic.

It is of two forms, *e.g.*—

(1) All A's are B's.
All B's are C's.
All C's are D's.
All D's are E's.

$\therefore$ All A's are E's.

(2) All D is E.
All C is D.
All B is C.
All A is B.

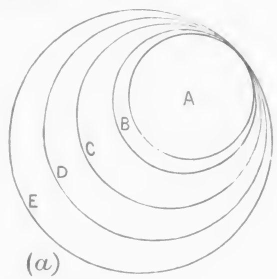
$\therefore$ All A is E.

(1) is called a Progressive Sorites,

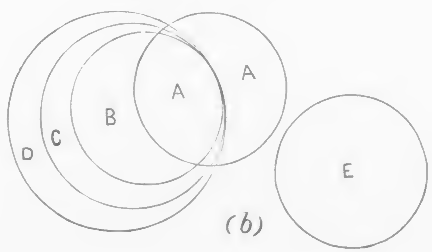
(2) a Regressive or Goclenian Sorites.

In (1) there may be one Particular Premiss, provided it be the first, and one Negative Premiss, provided it be the last. In (2) there may also be one Negative Premiss (the first), and one Particular Premiss (the last). Thus, in the examples given, A – B may be Particular, D – E may be Negative.

The relations of Terms may be represented by *e.g.* the following circles, thus



(*a*)



(*b*)

In (*a*) all the Propositions are Affirmative and Universal; in (*b*) one is Particular, and one is Negative.

(*a*) and (*b*) can each be resolved into a series of dependent Syllogisms, as follows :—

(*a*) (i.) All B is C.
All A is B.

All A is C.

(ii.) All C is D.
All A is C.

All A is D.

(iii.) All D is E.
All A is D.

All A is E.

This is a Progressive Sorites.

(*b*) (i.) No D is E.
All C is D.

No C is E.

(ii.) No C is E.
All B is C.

No B is E.

(iii.) No B is E.
Some A is B.

Some A is not E.

This is a Regressive Sorites.

It will be seen that in (*a*) the conclusion of each Syllogism of the chain furnishes the *Minor* Premiss of the next Syllogism; (i.) is therefore a Pro-syllogism to (ii.), and (ii.) is a Pro-syllogism to (iii.); while reciprocally (iii.) is Episyllogism to (ii.), and (ii.) is Episyllogism to (i.).

Correspondingly in (*b*), every conclusion furnishes the *Major* Premiss to the next Syllogism in the series, and the relations of Pro-syllogism and Episyllogism hold between (i.), (ii.), and (iii.).

A Sorites may equally well be Inferential or Alternative.

An Epicheirema is a compound and elliptical syllogism, in which to one or both Premisses there is attached a reason implying the existence of a Pro-syllogism which is not fully expressed. *E.g.*—

M is P (for it is Q);
S is M (for it is R);
∴ S is P.

V.

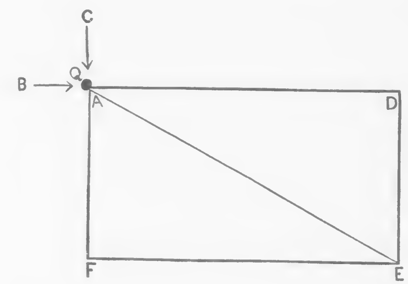
THE 'DEDUCTIVE METHOD' OF INDUCTION.

Besides the Methods of Induction described in Section XIII. (*cf.* also *post*, Note VI.), there is a Method of establishing Inductive generalisations which is described by Mill under the name of 'The Deductive Method.' Jevons considers that this might be more appropriately called the 'Combined' or 'Complete' method; and it corresponds very closely to what he regards as the true Method of Inductive Reasoning.

The 'Deductive Method' deals not with Simple but with Complex Effects, and 'its problem is to find the law of a complex effect from the laws of the different causes, of which this effect is the joint result.' The first step is to ascertain, by separate applications of Induction, the effect of *each* of the causes concerned in the joint result. (We might resolve this step into Observation, Hypothesis, and the application of the 'Methods of Experimental Inquiry'—*Method of Agreement, etc.*) The second step is Ratiocination (or Calculation, or Deduction), from the several simple laws to the complex case. The third step consists in the Verification of the results arrived at by the second step.

A stock illustration of the 'Deductive Method' is furnished by the 'Parallelogram of Forces.' We suppose a particle Q

at A to be acted upon by two forces B and C, and the problem is, to find the joint effect of B and C from a know-



ledge of the effect of B separately and C separately. We find that B would carry Q from A to D in time T; and that C would carry Q from A to F in time T. (This is the first step.)

We argue that, therefore, if B and C acted together, they would in time T carry Q as far as D in the one direction, and as far as F in the other. The point E is as far from A as D on the one hand, and as F on the other.

∴ *B and C* will carry Q from A to E in time T. This is the second step.

The Verification might consist in taking a particle Q at A, and causing B and C to act upon it simultaneously. If at the end of T, Q is at E, the third step (and with it the Verification) has been accomplished.

There are several variations of the 'Deductive Method'; for instance, the Verification may be by direct appeal to fresh experience (as above); or by appeal to the recorded results of previous experience (as Newton's theory of gravitation was to some extent verified by its agreement with Kepler's Laws).

VI.

MILL'S CANONS OF HIS 'FOUR METHODS OF EXPERIMENTAL [= EXPERIENTIAL] INQUIRY.'

First Canon—I. *Method of Agreement:*

If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree, is the cause (or effect) of the given phenomenon.

Second Canon—II. *Method of Difference:*

If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former; the circumstance in which alone the two instances differ is the effect or the cause, or an indispensable part of the cause, of the phenomenon.

Third Canon—Joint Method of Agreement and Difference:

If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance; the circumstance in which alone the two sets of instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.

(This method is also called briefly the *Joint Method*, or the *Method of Agreement in Presence and Absence*, or the *Indirect Method of Difference*. It is not reckoned by Mill as a separate Method.)

Fourth Canon—III. *Method of Residues:*

Subduct from any phenomenon such part as is known by previous inductions to be the effect of certain antecedents, and the residue of the phenomenon is the effect of the remaining antecedents.

Fifth Canon—IV. *Method of Concomitant Variations:*

Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation.

QUESTIONS AND EXERCISES

SECTION I.

1. Discuss the scope and definition of Logic; and show how the definition which you accept can be applied in the various departments of Logic.

2. What (if any) are the assumptions of ordinary Logic?

3. What do you understand by *Science?*
In what sense is Logic a Science, and what is its relation to other Sciences?

4. In what sense may Logic be called the Science of Sciences?
(J.)

SECTION II.

5. Define *Proposition*, and enumerate the different kinds of Propositions, with examples.

6. How is it that an examination of Names and Terms comes under the head of 'Import of Propositions'?
What do you understand by *Import of Propositions*?

7. Define *Name*; and describe the different kinds of Names, with examples.

8. Can you suggest
(*a*) Any explanation
(*b*) Any justification
for the fact that (in English and other languages) we find three distinct classes of Names, viz.:—
(1) Substantival Names (*e.g.* man)
(2) Attribute Names (*e.g.* humanity)
(3) Adjectival Names (*e.g.* human)?

9. What is meant by
(*a*) Application
(*b*) Signification
of Names and Terms? Illustrate your answer by examples.

10. Give a logical description of the following names:—

Fog—Whiteness.	William Shakspeare.
Violet—Fragrant.	The Thames.
King of Spain.	The highest mountain in the world.
January.	The sun.
The four elements.	Wordsworth.
Strong—Splendour.	Lion.
Equal to B.	Fairy.

11. What is meant by saying that the application and force of words depends upon context? Is this an absolute and unvarying rule? Illustrate by reference to the Dictionary.

12. Define *Term*, and give a tabulated list of the principal kinds of terms.

13. Discuss the importance of the distinction between Absolute and Relative Terms.

14. Distinguish between
(*a*) Collective and Non-collective Names
(*b*) Collective and Distributive use of Names.
Point out the Collective and Distributive use of the word *All* in the following:—
(1) All the angles of a triangle are equal to two right angles.
(2) All the angles of a triangle are less than two right angles.
(3) All men find their own in all men's good,
And all men join in noble brotherhood.

SECTION III.

15. Give an Analysis and a Definition of Categorical Propositions, with examples.

16. Draw up a Table of the principal kinds of Categorical Proposition.

17. Distinguish between the relations
(*a*) Of Terms
(*b*) Of Classes.

18. What do you consider to be the essential distinctions between the Subject and Predicate of a Proposition? Apply your answer to the following :—

The lake of Geneva is blue.
That is exactly what I wanted.
Great is Diana of the Ephesians.
Twenty-four prisoners were released.
All pedants are absurd.

(C. somewhat altered.)

19. Determine the Subject of the Proposition, 'Cambridge is the winner.' Is it true to say that 'an Adverb cannot form the Subject of a Proposition'? If so, what is the subject of the Proposition you have declared to be true?

(C. shortened.)

20. Examine the following statements :—

(1) When we refer vaguely to X we always *mean* All X or Some X.

(2) Even 'Some X' means *All* of that *Some.*

(C. modified.)

21. Distinguish Universal and Particular Categorical Propositions. Determine the Quantity of each of the following :—

(1) The king is dead.
(2) None need despair.
(3) All that glitters is not gold.
(4) One Trinity man was in the first class.

(C.)

22. Take the following Propositions, and put them into proper logical form, pointing out the Subject and Predicate in each case :—

(1) All day long the noise of battle rolled
Among the mountains.
(2) In truth we have lived carelessly and well.
(3) Into the street the piper stepped,
Smiling first a little smile.
(4) With Time I have no quarrel.
(5) Every why hath a wherefore.
(6) Only the brave deserve the fair.
(7) A stitch in time saves nine.
(8) All men find their own in all men's good.

(9) He jests at scars who never felt a wound.
(10) Every mistake is not culpable.
(11) Few men attain celebrity.
(12) He can't be wrong whose life is in the right.
(13) No news is good news.
(14) All is fine that is fit.
(15) All is not gold that glitters.
(16) There are three things to be considered.
(17) James misunderstood Thomas.
(18) A few of the apples are ripe.

23. Give a logical description

(*a*) Of the following Propositions
(*b*) Of their Terms :—

(1) Every mistake is not a proof of ignorance.
(2) Any schoolboy could tell you that.
(3) Life every man holds dear.
(4) Spring, Summer, Autumn, and Winter are the four seasons.
(5) Nothing in his life
Became him like the leaving it.
(6) He who fights and runs away
Will live to fight another day.
(7) No one is a hero to his valet.
(8) None think the great unhappy but the great.
(9) Honesty is the best policy.
(10) Aglaia, Thalia, and Euphrosyne were the three Graces.
(11) Snowdon is the highest mountain in Wales.
(12) Those trees are oaks.
(13) $2+2=4$.
(14) A is equal to B.
(15) C is larger than D.
(16) Philip was the father of Alexander.
(17) Some mistakes are a proof of genius.
(18) A bargain's a bargain.
(19) Some kindness is cruel.
(20) Some wisdom is folly.
(21) To err is human.
(22) To him that will, ways are not wanting.
(23) All's well that ends well.
(24) Some death is better than some life.
(25) $2+5-1=2\times 3$.

SECTION IV.

24. Discuss the nature of the difference between Relative and Absolute Propositions, and consider the logical importance of this distinction.

25. How would you
(1) class
(2) interpret
Mathematical Propositions?

SECTION V.

26. Define *Inferential Proposition.*

27. Exhibit the elliptical character of Hypothetical Propositions which are not Self-contained.

28. Explain fully the distinction between Hypothetical and Conditional Propositions; and determine which of the following propositions are Hypothetical and which Conditional:—
(1) If all men were capable of perfection, some would have attained it.
(2) If this is admitted, the logical question is disposed of.
(3) If any beggar comes to the door, he is to have a penny.
(4) If a child is spoilt, he is sure to be troublesome.
(5) If this is true, you are mistaken.
(6) If any violet is white, it is fragrant.
(7) If he told you anything, it is true.
(8) If Charles I. had not deserted Strafford, he would be more deserving of sympathy.

29. Classify Hypothetical and Conditional Propositions, with examples.

SECTION VI.

30. Define *Alternative Proposition*, and explain in what sense the elements of Alternative Propositions must be
(1) exclusive
(2) unexclusive.

31. Draw up a Table of Alternative (Disjunctive) Propositions, with illustrations.

SECTIONS V. AND VI.

32. Define and analyse Hypothetical, Conditional, and Disjunctive (Alternative) Propositions.

SECTION VII.

33. Discuss the place and value of Quantification in Logic.

34. What objections lie against the view that the predicate of a Logical Proposition should be written as a Quantity?
(O.)

35. To what extent would the eight propositions which result from predicating of *all* or *some* trains that they do, or do not, stop at *all* or *some* stations, coincide with the eight forms obtained by quantifying the Predicates of the ordinary Class Propositions, A, E, I, O?
(Adapted from C.)

36. Point out any logical difficulties connected with the use of the words *some*, *few*, *any*; and discuss the proper logical signification of these words.
(C.)

SECTION VIII.

37. Give a general account of the Relations of Propositions, with examples.

38. What is meant when it is said that one proposition is *related* to another?

39. What conditions are necessary in order that we should connect propositions by the conjunctions *and*, *but*, etc.?

SECTION IX.

40. Define
Inference
Immediate Inference
Mediate Inference
with examples.

41. Discuss the meaning and importance of the division of Mediate Inferences into Absolute and Relative.

42. What is the distinction between
(*a*) Immediate and Mediate Inference
(*b*) Induction and Deduction.

43. Define the following words—
Equivalent
Inference
Eduction;
and give some examples of (*a*) Equivalent Categorematic words (*b*) Syncategorematic Equivalent words.

SECTION X.

44. Define *Immediate Inference* (*Eduction*); and draw up a Table of the most important kinds of Immediate Inference.

45. Point out (1) the general principles of all Inference, (2) the special principles of Immediate Inference.
(L. shortened.)

46. Explain, and justify, the principal kinds of Immediate Inference (Eduction).

47. All crystals are solids.
Some solids are not crystals.
Some not crystals are not solids.
No crystals are not solids.
Some solids are crystals.
Some not solids are not crystals.
All solids are crystals.
Assign the logical relation, if any, between the first of these propositions and each of the others.
(L. slightly altered.)

48. Give as complete a Table as you can of the principal Immediate Inferences which can be drawn from—
(1) All R is Q.
(2) No R is Q.
(3) Some R is Q.
(4) Some R is not Q.

49. Give the Converse of
(1) A stitch in time saves nine.
(2) Fortune often sells to the hasty what she gives to those who wait.

50. Give the Contrapositive [Contraverse] and Converse of each of the following:—
(1) If any nation prospers under a Protective System, its citizens reject all arguments in favour of Free Trade.
(2) If any nation prospers under a Protective System, we ought to reject all arguments in favour of Free Trade.
(C. shortened.)

51. Examine the following:—
(*a*) Men are weak mortals; therefore weak men are mortal.
(*b*) If it is happy to be ignorant, it is miserable to be wise.
(C. shortened.)

52. By what process do we pass from each of the following propositions to the next?
(1) No knowledge is useless.
(2) No useless thing is knowledge.
(3) All knowledge is not useless.
(4) All knowledge is useful.
(5) What is not useful is not knowledge.
(6) What is useless is not knowledge.
(7) No knowledge is useless.
(J.)

53. By what processes can we infer from *All A is B* that—
(1) Some B is A,
(2) All not B is not A,
(3) Some not A is not B,
(4) All AC is B?
Show by a diagram the correctness of each inference.
(C. shortened.)

54. Determine the Subject and Predicate of each of the following propositions, and examine how they can be logically converted—
(*a*) The angles of a square are equal to one another.
(*b*) James was John's brother.
(*c*) Justice and equity are not the same.
(*d*) A teacher need not be a pedant.
(C.)

55. Give, as far as you can, the Obverse, Converse, and Contrapositive (Contraverse) of the following Propositions :—

(1) No news is good news.
(2) All the angles of a triangle are equal to two right angles.
(3) All 's well that ends well.
(4) An honest miller has a golden thumb.
(5) P struck Q.
(6) Dick is stronger than Tom.
(7) Some mistakes are disastrous.
(8) Improbable events happen every day.
(9) It snows.
(10) All that glitters is not gold.
(11) All the angles of a triangle are less than two right angles.
(12) If ancient astronomers were right, the sun goes round the earth.
(13) If all the year were playing holidays,
To sport would be as tedious as to work.
(14) If better were within, better would come out.
(15) I care for nobody, no, not I,
If nobody cares for me.
(16) If a proposition is Categorical, it consists of Terms and Copula.
(17) If things were to be done twice,
All would be wise.
(18) If a man be too fortunate, he will not know himself; if he be too unfortunate, others will not know him.
(19) If a man hath one true friend, he hath more than his share.
(20) Any goose is grey or white.
(21) The book is either blue or green.
(22) Either Honesty is the best policy, or Life is not worth having.

56. Explain Conversion and Contraposition [Contraversion]. Apply them to the following :—
(*a*) No lamps are required.
(*b*) Some unfortunate people do but meet with their deserts.
(*c*) No one who could help it came.

(C.)

57. Discuss the formal validity of the following arguments:— All P is Q, therefore All AP is AQ; All AP is AQ, therefore Some P is Q; All A is P or Q, therefore No AP is AQ.

(C.)

58. 'By the use of negative terms, all propositions may be reduced to the affirmative form.'

'By the use of negative propositions, negative terms may always be eliminated.'

Discuss these statements.

(C.)

59. Leslie Ellis pointed out that, though a St. Bernard dog is certainly a dog, a small St. Bernard dog is not a small dog. Examine this.

(L. altered.)

60. Express the whole import of the Proposition, 'Either A is B or C is D,' in the form of a single Hypothetical, and prove the adequacy of your expression. Give the converted obverse of the proposition, 'All A that is neither B nor C is both X and Y.'

(L.)

61. Put, if you can, the whole meaning of a Disjunctive [Alternative] Proposition into a single and simple Hypothetical, and prove your expression to be sufficient.

(C.)

SECTION XI.

62. Classify Incompatible Propositions, and define
(*a*) Contrary
(*b*) Contradictory.

63. Find the Contradictory of each of the following propositions :—
(1) All S is all P.
(2) Either every S is P or every P is S.
(3) If every S is P, then every P is S.

(C.)

64. Of two Contrary Propositions, the affirmation of the one gives a right to deny the other, but the denial of one gives no right to affirm the other. Prove this with an example.

(C.)

65. Show by means of the Sub-contrary Propositions that Contrary Propositions may both be false.

(J.)

66. Show why the following propositions are not true Contradictories :—

(1) Wherever A is present B is present, and either C or D is also present.

(2) In some cases where A is present, either B or C or D is absent.

How must (2) be amended in order that it may become the true Contradictory of (1)?

(C. shortened.)

67. Give the Contrary and Contradictory of the following Propositions :—

(1) If this bill passes, the dock labourers will benefit.

(2) If the sun goes round the earth, ancient astronomers were wrong.

(3) If black is white, he is a person to be trusted.

(4) If the earth were only 6000 miles in diameter, it would be less than 24,000 miles in circumference.

(5) If any violet were scarlet it would be scentless.

(6) If any goose is not grey, it is white.

68. What Propositions are true, false, or doubtful—

(1) When A is false?
(2) When E is false?
(3) When I is false?
(4) When O is false?

(J.)

69. Prove, by means of the Contradictory Propositions, that Sub-contrary Propositions cannot both be false.

(J.)

SECTIONS X. AND XI.

70. Write down the Converse and Contradictory of each of the following :—

(*a*) England expects every man to do his duty.
(*b*) Whenever it rains I stay at home.
(*c*) Any one of average intelligence could answer this question.

(C.)

71. Discuss the nature of the distinction between Categorical and Hypothetical propositions.

Examine the logical relation between the two following propositions, and inquire whether it is logically possible to hold (*a*) that both are true, (*b*) that both are false :—(i) If volitions are undetermined, then punishments cannot be rightly inflicted ; (ii) If punishments can be rightly inflicted, then volitions are undetermined.

(C.)

72. Classify the propositions subjoined into the four following groups :—

(*a*) Those which can be inferred from (1) ;
(*b*) Those from which (1) can be inferred ;
(*c*) Those which do not contradict (1), but cannot be inferred from it ;
(*d*) Those which contradict (1).

(1) All just acts are expedient acts.
(2) No expedient acts are unjust.
(3) No just acts are inexpedient.
(4) All inexpedient acts are unjust.
(5) Some unjust acts are inexpedient.
(6) No expedient acts are just.
(7) Some inexpedient acts are unjust.
(8) All expedient acts are just.
(9) No inexpedient acts are just.
(10) All unjust acts are inexpedient.
(11) Some inexpedient acts are just acts.
(12) Some expedient acts are just.
(13) Some just acts are expedient.
(14) Some unjust acts are expedient.

(J.)

SECTION XII.

73. Define

(*a*) Categorical Argument
(*b*) Categorical Syllogism.

74. State and explain the Canon of Categorical Syllogisms.

75. Define carefully, with examples, the following words, and

mention any synonyms of either of them with which you may be acquainted :—

Same	Different
Identical	Diverse
Similar	Distinct.

76. State and justify the Rules of Categorical Syllogism.

77. State and explain the *Dictum de omni et nullo.* What is its place and value in inference?

78. How is it that when M is predicate in both the premisses of a [Class] Syllogism, the Major Premiss of the Syllogism must be universal. (C.)

79. 'Two negative propositions prove nothing.' Why not?
Examine the following :—
No perfect result was recorded ;
Professor A.'s results were not imperfect ;
It must, therefore, be a fact that Professor A.'s results are not recorded. (C.)

80. Supply premisses to the following conclusions :—
(1) Some logicians are not good reasoners.
(2) The rings of Saturn are material bodies.
(3) Party government exists in every democracy.
(4) All fixed stars obey the law of gravitation.
(J.)

81. Exhibit the following arguments in logical form, and test their validity by the rules of Syllogism :—

(*a*) Where ignorance is bliss, 'tis folly to be wise.

(*b*) If those who mean nobly act nobly, all heroes must be men of lofty aspirations.

(*c*) None but the contented are happy, none but the virtuous are contented, none but the wise are virtuous, therefore none but the wise are happy.

(*d*) Queen Victoria is the mother of the Duke of Edinburgh, the Duke of Kent is the father of Queen Victoria, therefore the Duke of Kent is the grandfather of the Duke of Edinburgh. (C.)

82. Put the following arguments in logical form, and consider their value :—

(1) He must have been the thief, for he ran away when they called for the police.

(2) The study of grammar is useless ; for some men write grammatically without it, and others write ungrammatically in spite of it.

(3) This cloth is too cheap to be good.
(O. slightly altered.)

83. 'No wise man is unhappy ; for no dishonest man is wise, and no honest man is unhappy.' Examine this inference, and, if you think it sound, resolve it into a regular syllogism. (L.)

84. If it be known concerning a [Categorical] Syllogism that the Middle Term is twice Universal, what do you know concerning the conclusion? Prove your answer. (L.)

85. Take the premisses of an ordinary Syllogism in Barbara, such as

All X's are Y's,
All Y's are Z's.

Determine precisely and exhaustively what those propositions affirm, what they deny, and what they leave in doubt, concerning the relations of the Terms X, Y, and Z. (L.)

86. What do you understand by *Mood* and *Figure* in Syllogism?

87. Explain the terms *Figure* and *Reduction* as applied to the Syllogism.

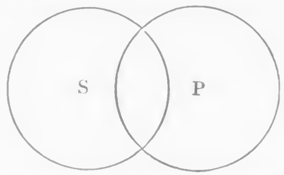
Find what connection between *Philosophers* and *Illiterate Persons* can be syllogistically concluded from each of the following :—

(1) B, though an illiterate person, was a philosopher.

(2) Some illiterate persons, but no philosophers, use strong language.

Give in each case the mood and figure of the syllogism, and show how it may be reduced to the first Figure. (C.)

88. Express by means of ordinary Categorical Propositions the relation between S and P represented by the following diagram :—



Represent Celarent by the aid of Euler's diagrams. Will the same set of diagrams serve for any other of the syllogistic moods?

(C. shortened.)

89. Show (*a*) that the following moods are invalid in any figure :
AIA, EEI, IEA, IOI, IIA, AEI;
b) in what figures the following premisses give a valid conclusion :
AA, AI, EA, OA;
(*c*) in what figures IEO and EIO are valid.

(Adapted from J.)

90. To what moods do the following valid syllogisms belong? Arrange them in correct logical order.

(1) Some Y's are Z's,
No X's are Y's,
Some Z's are not X's.

(2) All Z's are Y's,
No Y's are X's,
No Z's are X's.

(J. shortened.)

91. Deduce conclusions from the following premisses, and state to what mood the syllogism belongs :—

(1) Some amphibia are mammalian;
All mammalians are vertebrate.

(2) All planets are heavenly bodies;
No planets are self-luminous.

(3) Mammalians are quadrupeds;
No birds are quadrupeds.

(4) Ruminants are not predacious;
The lion is predacious.

(J.)

92. Prove, generally, without reference to particular moods, that in the third Figure the Minor Premiss must be affirmative and the conclusion particular, and that the second Figure can prove only negatives.

Examine the argument: 'You cannot be right in denying that any of the killed were English, considering that none but English were in camp, and none but those in camp were killed.'

(C.)

93. Which kind of proposition cannot become a premiss in the first Figure, and why not?

(C.)

94. For what reasons must an affirmative major premiss be followed by an affirmative minor premiss in the first and third figures, by a negative minor in the second, and by a universal minor in the fourth?

(O.)

95. Why cannot O stand as a Premiss in the first Figure, as Major in the Third, or as a Premiss in the fourth?

(C. shortened.)

96. If it be known concerning a Class-syllogism that the Middle Term is distributed in both premisses, what can we infer as to the conclusion?

(C. slightly changed.)

97. Prove that the third Figure must have an affirmative Minor Premiss, and a Particular Conclusion.

(J.)

98. Reduce the moods Cesare and Camenes by the Indirect Method, or *Reductio ad Impossibile.*

(J.)

99. Write out a Syllogism in each of the Four Figures.

100. Why must the conclusion in Fig. 2 be negative, and the conclusion in Fig. 3 particular?

101. Construct Syllogisms in Baroko and Camenes, and reduce them to Fig. 1.

102. Reduce Bokardo both directly and indirectly.

103. Reduce Barbara to Celarent, Darii, and Ferio.

104. What is meant by an argument *à fortiori*? Give an example, and show the exact logical foundation of the reasoning.
(C.)

105. State the Canon of Relative Categorical Arguments, and explain why it is not more precise.

SECTION XIII.

106. Take an instance of an Inductive Generalisation (not mathematical), and set out at full length the reasonings and assumptions which it involves.

107. State and explain the Inductive Principle of Interdependence.

108. It is maintained, on the one hand, that no inference is valid in which the conclusion is not contained in the premisses; and, on the other hand, that no movement of thought deserves to be entitled Inference in which there is not progress from the known to the unknown. Examine the grounds for the two statements, and discuss the possibility of holding them jointly.
(L.)

109. Distinguish between Inference and Conjecture. How do the Premisses of an Inductive Inference differ from those of a Deductive?

'The wind has gone round to the west, and we shall have rain.' Analyse fully the logical processes involved in this assertion.
(C.)

110. 'In one instance AB is followed by XY; in another, AC is followed by XZ.' Show concisely what general postulates, and what special conditions, are required to justify each of the following inferences from the above:—

(1) Every A is followed by an X;
(2) Every B is followed by a Y;
(3) Every X is preceded by an A;
(4) Every Y is preceded by a B.
(C.)

111. If any one told you that he saw a ghost last night, what grounds would you have for disbelieving him, and what ought to be the limits of your incredulity?
(C.)

112. When two phenomena are causally connected together, can you always ascertain which is the cause and which is the effect? If so, how?
(L.)

113. Explain the terms *Law*, *Uniformity*, *Cause*.

Examine into the use of the word *Cause* in the following:—

(*a*) The cause of his mistake was ignorance.

(*b*) The cause of the fall of a stone is the universal law of gravitation.
(C.)

114. Can you account for the unique character of Mathematical Generalisations?

115. What is the general nature of an argument from Analogy? How do you distinguish Analogy from Metaphor and Example?
(C.)

116. Set out at length an instance of an Inductive Argument by Analogy.

117. Distinguish between Induction, Analogy, and Example.

Of what kind are the following arguments, and why?

(*a*) If a stone breaks the window, so will a cricket-ball;

(*b*) If one penny turns greenish when dipped in vinegar, so will all pennies;

(*c*) If birds of a feather flock together, so will men of the same trade.
(C.)

118. Define Hypothesis, and give some tests for judging the value of a Hypothesis.
(C.)

119. Describe the methods which might be used to establish the following laws:—

'Bodies expand under the action of heat.'
'Commerce is benefited by free trade.'
(C.)

120. Discuss the value of the Method of Agreement and the Method of Difference, contrasting them as to the possibility of applying them, and their conclusiveness when applied.

(C.)

121. Analyse briefly the logical methods by which are established—

(*a*) the Law of Universal Gravitation;
(*b*) the Parallelogram of Forces;
(*c*) the proposition that the three angles of every triangle are together equal to two right angles.

(C.)

122. By what logical methods would you test the following propositions:—

(*a*) Air has weight.
(*b*) A moving body, unless interfered with, never changes its direction or velocity.
(*c*) Free trade conduces to national prosperity.
(*d*) In social development, the military precedes the industrial state.

(C.)

123. Which of the Inductive Methods is best adapted to scientific inquiry in the cases where experiment is impossible?

(C. shortened.)

124. Enumerate and explain, with illustrations, the so-called *Methods of Induction*, and point out their precise place and value in Logic.

125. Write down the definitions, axioms, and postulates involved in proving the causal dependence of phenomena by the Method of Agreement.

(C.)

126. Explain what is meant by the Joint Method of Agreement and Difference; and point out wherein it differs from the Simple Method of Difference.

(C.)

127. Why is a single instance sometimes sufficient to warrant an universal conclusion, while in other cases the greatest possible number of concurring instances, without any exception, is not sufficient to warrant such a conclusion?

(J.)

128. What can you infer from the following instances?

Antecedents.	Consequents.
ABDE	stqp.
BCD	qsr.
BFG	vqu.
ADE	tsp.
BHK	zqw.
ABFG	pquv.
ABE	pqt.

(J.)

129. Supposing us to be unacquainted with the causes of the following phenomena, by what method should we investigate each?

(1) The connection between the barometer and the weather.
(2) A person poisoned at a meal.
(3) The connection between the hands of a clock.
(4) The effect of the Gulf Stream upon the climate of Great Britain.

(J.)

130. Draw up a list of the Experimental Methods, in what you consider to be the order of their cogency. Give reasons for your arrangement of them, and show that they are all 'reducible to two only, the Method of Agreement and the Method of Difference.'

(C.)

SECTION XIV.

131. Define and divide *Inferential Mediate Inference.*

132. Discuss the nature of the reasoning contained, or apparently intended, in the following sentences:—

(*a*) It is impossible to prove that persecution is justifiable if you can't prove that some non-effective measures are justifiable, for no persecution has ever been effective.
(*b*) This deed may be genuine though it is not stamped, for some unstamped deeds are genuine.

(C.

133. Examine the following arguments :—

(i) If the earth turns on its axis, falling bodies must diverge from the perpendicular; now, experiment shows that they do so diverge, therefore the earth must turn on its axis.

(ii) How can you admit that any wise men are unhappy, when you deny that any dishonest men are wise, and also that any honest men are unhappy?

(C.)

SECTION XV.

134. Define *Alternative* (or *Disjunctive*) *Mediate Inference.*

135. What is the Canon of Pure Alternative Arguments?

136. Arrange in logical form the following argument :—

Compulsory legislation against intemperance is to be avoided; for it is mischievous if obeyed unwillingly, and useless if obeyed willingly.

(C.)

137. 'If X is true, then either Y or Z is true; but Y is not true.' What conclusion can be drawn?

(C. shortened.)

SECTION XVI.

138. Discuss briefly the characteristics of a satisfactory Method of Science.

139. Enumerate the rules for a sound Division, and the requisites for a good Classification. Is there any connection between the Principles of Division and those of Classification?

(C.)

140. Divide any of the following classes :—

Governments,
Sciences,
Logical Terms,
Propositions.

(J.)

141. What is meant by Cross Division and the *fundamentum divisionis*? Illustrate by giving a classification of Games.

(C.)

142. Criticise the following Divisions :—

(1) *Great Britain* into England, Scotland, Wales, and Ireland.
(2) *Pictures* into sacred, historical, landscape, and mythological.
(3) *Vertebrate Animals* into quadrupeds, birds, fishes, and reptiles.
(4) *Plant* into stem, root, and branches.
(5) *Ship* into frigate, brig, schooner, and merchantman.
(6) *Books* into octavo, quarto, green and blue.
(7) *Figures* into curvilinear and rectilinear.
(8) *Ends* into those which are ends only, means and ends, and means only.
(9) *Church* into Gothic, Episcopal, High, and Low.
(10) *Sciences* into physical, moral, metaphysical, and medical.
(11) *Library* into public and private.
(12) *Horses* into racehorses, hunters, hacks, thoroughbreds, ponies, and mules.

(Stock, *Deductive Logic.*)

143. The first name in each of the following series of terms is that of a class which you are to divide and subdivide so as to include all the subjoined minor classes in accordance with the laws of Division :—

(1) *People.*

Laity.	Natural-born Subjects.
Aliens.	Clergy.
Naturalised Subjects.	Baronets.
Peers.	Commons.

(2) *Triangle.*

Equiangular.	Scalene.
Isosceles.	Obtuse-angled.
Right-angled.	

(3) *Reasoning.*

Induction.	Hypothetical Syllogism.
Deduction.	Disjunctive Syllogism.
Mediate Inference.	

(J.)

144. Distinguish between—

Classing,
Classification,
Systematisation ;

and discuss the relation between Division and Classification.

145. Explain the main objects aimed at in a scientific classification.

(C.)

146. Suggest principles on which a classification

(1) of the Sciences,
(2) of Athletic Games,

might be based ; and illustrate your suggestions by drawing up a scheme of classification of (1) or (2).

SECTION XVII.

147. What do you understand by the *Definition* of a word? How is Signification determined?

148. Discuss the relation between—

(*a*) Definition and Classing,
(*b*) Classing and Induction.

149. Discuss some of the sources of ambiguity in language ; and point out the varying importance, in different cases, of a reference to context.

150. Distinguish the different objects aimed at in definition ; and consider how the method and rules of definition will vary according to the object primarily had in view.

(C.)

151. What are the principal faults to be avoided in a definition? Illustrate them by definitions of 'Athletics' and 'Examinations.'

(C.)

152. What are the objections to the following definitions?

(*a*) A table is a wooden article of furniture not intended to be sat upon.

(*b*) Barbarism is the name given to the condition of such countries as Patagonia, the Feejee Islands, etc.

(C. shortened.)

153. When is Definition serviceable for recognition?

154. Criticise the following definitions :—

(1) A barometer is a thing that you tap in the hall, and grunt.

(2) An albatross is a bird known to the readers of Coleridge's *Ancient Mariner*.

(3) A net is a reticulated fabric, decussated at regular intervals.

(4) An Archdeacon is a person who performs archi-diaconal functions.

(5) An acute-angled triangle is a triangle which has one acute angle.

(6) A geranium is a scarlet flower.

(7) The dog is the friend of man.

(8) Selfishness is the bane of Society.

(9) A circle is a plane figure contained by one line.

(10) A triangle is a figure contained by three straight lines of equal length.

155. What are the requisites for the full equipment of a language for scientific purposes?

(C.)

156. What are the chief tendencies at work in altering the meaning of names? Illustrate them.

(C.)

157. To what extent is Definition an *arbitrary* Process? Illustrate by reference to definitions in Natural History and Political Economy.

(C.)

158. Explain what is the logical ideal of language regarded as an instrument of thought ; and show why this ideal is practically unattainable.

Under what conditions, and within what limits, is it legitimate to employ an old word with a new meaning?

(C.)

SECTION XVIII.

159. Define *Fallacy*, with examples.

160. Give a classification of Fallacies.

Examine the ambiguities in the following :—
(*a*) He likes work and athletics very much.
(*b*) How much is 5 added to 3 squared ?
How are such ambiguities as the above avoided by mathematical notation?

(C.)

161. Examine the following arguments. Where they are valid, reduce them to syllogistic form ; and where they are invalid, explain the nature of the fallacy :—

(*a*) His cowardice might have been inferred from his cruelty ; for all cowards are cruel.

(*b*) None but members of the University are present ; all who are present are members of the Union ; therefore all members of the Union are members of the University.

(*c*) No unjust man is happy ; for all wise men are just, and no man who lacks wisdom is happy.

(C.)

162. Examine the following :—

You do not know what I am going to ask you about. Now I am going to ask you about the nature of the fallacy called *Ignoratio Elenchi.* It seems, therefore, that you do not know the nature of the fallacy called *Ignoratio Elenchi.*

(Shortened from C.)

163. Examine the following :—

(1) Governments are good which promote prosperity ;
The government of Burmah does not promote prosperity ;
Therefore it is not a good government.

(2) Land is not property ;
Land produces barley ;
∴ Beer is intoxicating.

(3) Nothing is property but that which is the product of man's hand ;
The horse is not the product of man's hand ;
∴ The horse is not property.

(4) Saturn is visible from the earth, and the moon is visible from the earth ;
∴ The moon is visible from Saturn.

(5) Sparing the rod spoils the child ; so John will turn out very good, for his mother beats him every day.

(6) Socrates was wise, and wise men alone are happy ;
Therefore Socrates was happy.

(Adapted from Stock, *Deductive Logic.*)

164. Persons, it is said, acquire wisdom by experience. Indicate clearly the logical and extra-logical operations involved in the process. Show to what kinds of error the following popular proverbs point :—

All is not gold that glitters.
Do not count your chickens before they are hatched.
A man is not a horse because he is born in a stable.
A bad workman complains of his tools.
Happy is the bride the sun shines on.

(C. slightly altered.)

165. Them or thir feythers, thou sees, mun 'a beän a laäzy lot,
For work mun 'a gone to the gittin', whiniver munny was got.

Examine the validity of the argument implied in the above.

166. Examine the following arguments :—

(*a*) If an import duty affords Protection, it is mischievous ;
This import duty is mischievous ;
Therefore it affords Protection.

(*b*) Ironmongers sell penknives ;
This man has sold a penknife ;
Therefore he is an ironmonger.

(*c*) A is B or C ;
A is C ;
Therefore A is not B.

167. Write a brief essay on the forms of Fallacy most usually found in writing and speaking.

(C.)

SECTIONS XII., XIV., XV., XVIII.

168. Examine the following arguments :—

(1) Rain has fallen if the ground is wet ; but the ground is not wet ; therefore rain has not fallen.

(2) If rain has fallen, the ground is wet ; but rain has not fallen ; therefore the ground is not wet.

(3) The ground is wet if rain has fallen ; the ground is wet ; therefore rain has fallen.

(4) If the ground is wet, rain has fallen ; but rain has fallen ; therefore the ground is wet.

(5) *Cogito ; ergo, sum.*

(6) Blessed are the merciful ; for they shall obtain mercy.

(7) Every candid man acknowledges merit in a rival ; every learned man does not do so ; therefore every learned man is not candid.

(8) If pain is severe, it will be brief ; and if it last long it will be slight ; therefore it is to be patiently borne.

(9) Elementary substances alone are metals ; Iron is a metal ; therefore iron is an elementary substance.

(10) Nothing is better than wisdom ; dry bread is better than nothing ; therefore dry bread is better than wisdom.

(11) His imbecility of character might have been inferred from his proneness to favourites ; for all weak princes have this failing.

(12) Every one desires virtue, because every one desires happiness.

(13) Books are a source both of instruction and amusement ; a table of logarithms is a book ; therefore it is a source of both instruction and amusement.

(14) You are not what I am ; I am a man ; therefore you are not a man.

(15) Gold and silver are wealth ; and therefore the diminution of the gold and silver in the country by exportation is the diminution of the wealth of the country.

(16) Night must be the cause of day : for it invariably precedes it.

(17) All presuming men are contemptible ; this man, therefore, is contemptible ; for he presumes to believe that his opinions are correct.

(18) Who is most hungry eats most ; who eats least is most hungry ; therefore who eats least, eats most.

(19) Honesty deserves reward ; and a negro is a fellow-creature ; therefore an honest negro is a fellow-creature deserving of reward.

(20) A man that hath no virtue in himself ever envieth virtue in others ; for men's minds will either feed upon their own good or upon other's evil ; and who wanteth the one will prey upon the other.

(21) The scarlet poppy belongs to the genus Papaver, of the natural order Papaveraceæ ; which, again, is part of the sub-class Thalamifloræ, belonging to the great class of Dicotyledons. Hence the scarlet poppy is one of the Dicotyledons.

(22) Improbable events happen almost every day ; but what happens almost every day is a very probable event ; therefore improbable events are very probable events.

(23) Elephants are stronger than horses ; horses are stronger than men ; therefore elephants are stronger than men.

(24) Alexander was the son of Philip ; therefore Philip was the father of Alexander.

(25) Nay, look you, I know 'tis true ; for his father built a chimney in my father's house, and the bricks are alive at this day to testify to it.

(26) It is probable that Herodotus recorded only what he heard concerning Ethiopia ; and it is not unlikely that most of what he heard was correct ; so that we may accept his account as true.

(27) In defending a prisoner, his counsel must either deny that the deed committed is a crime, or he must deny that the prisoner committed the deed ; therefore, if the counsel denies that the deed committed is a crime, he must admit that the prisoner did commit the deed.

(28) 'I will go on,' said King James. 'I have been only too indulgent. Indulgence ruined my father.'

(29) A magnitude required for the solution of a problem must satisfy a particular equation ; and as the magnitude X satisfies this equation, it is therefore the magnitude required.

(30) If we never find skins except as the teguments of animals, we may safely conclude that animals cannot exist without skins. If colour cannot exist by itself, it follows that neither can anything that is coloured exist without colour. So, if language without thought is unreal, thought without language must also be unreal.

(From J.)

SECTION XIX.

169. Discuss the meaning and implications of the Law of Identity in Diversity.

170. Consider the relations between the Laws of—
(*a*) Identity in Diversity,
(*b*) Contradiction,
(*c*) Excluded Middle.

171. Examine the Inductive Principle of Interdependence.

172. What are the assumptions on which Mill's Inductive Methods are based?

173. Consider the importance in Logic of the Principle of Identity in Diversity.

174. State the Principles of Relative Inference and the Principle of Self-evidence.

175. Show how the principal Categories of Logic come under the head of Unity in Difference.

MISCELLANEOUS.

176. An unintelligent person is popularly said to be incapable of putting two ideas together. Examine this statement, and illustrate by it the subject-matter of logical inquiry.

(C.)

177. State the precise character, and give a complete analysis of the logical procedure adopted by Euclid in demonstrating the proposition: 'Upon the same base, and on the same side of it, there cannot be two triangles that have their sides which are terminated in one extremity of the base equal to one another, and likewise those which are terminated in the other extremity.'

(C.)

178. Show the precise value and character of historical evidence.

(C.)

179. Show the precise character and value of statistical evidence.

(C.)

180. Give a logical analysis of Euclid's method of finding the centre of a circle.

(C.)

181. What is meant by the *distribution* of terms in a proposition? Explain why from the proposition, 'All equilateral triangles are equiangular,' we cannot infer, 'All equiangular triangles are equilateral'; but from 'No parallel lines meet,' we may infer, 'No lines which meet are parallel.'

(C.)

182. State the precise character, and give a complete analysis of the logical procedure adopted by Euclid in demonstrating the proposition, 'If two angles of a triangle be equal to each other, the sides also which are opposite to the equal angles shall be equal to each other.'

(C.)

183. Describe the methods of reasoning known as—
(*a*) *Inductio per enumerationem simplicem*,
(*b*) Analogy.

(C.)

184. What difference of meaning would you assign to the terms Sophism, Fallacy, Paralogism, and Paradox? Explain precisely what is meant by *Petitio Principii.*

(L.)

185. Construct a *Tree of Porphyry*, illustrating by it, as far as you can, the Predicables, Division and Definition; and take *Inference* for your *Summum Genus*, and *Bokardo* for your *Infima Species.*

186. Explain and illustrate what is meant by *Perfect Induction.* Give and discuss reasons for and against the view that Perfect Induction is improperly called Induction. (*Cf.* Note III.)

(C.)

187. 'As often as the same circumstances are repeated the same effect will follow, yet where the effect is the same we cannot infer that the cause is the same too.' Explain this statement fully, taking especial account of the meaning to be given to *same.*

(L.)

188. *Cessante causa cessat et effectus.* Discuss this doctrine, and consider whether the cases in which it appears true, and the cases in which it does not, have each some other distinguishing characteristic by which this difference might be explained.

(L.)

189. Explain—

(1) *Dictum de omni et nullo.*
(2) Illicit Process of the Major.
(3) Undistributed Middle.
(4) Reduction.

Why are

AEE, OAO, AOO,

invalid moods in Fig. 1?

Explain and illustrate by original examples the use of the mnemonic letters in

Camestres,
Bokardo,
Baroko.

(C. slightly altered.)

190. Describe the process of Mediate Inference, and give the rules for testing its validity. Show clearly why the first and third figures of the Syllogism require the minor premiss to be affirmative, and why the second figure must have a negative conclusion.

(C. slightly altered.)

191. Describe the Methods of Agreement and Difference, indicating the nature and degree of cogency of each. Why may they be called Methods of Elimination? Illustrate their application by original examples.

(C. slightly altered.)

192. What do you mean by saying that 'a phenomenon has been satisfactorily explained'?

(C.)

193. Construct a *Ramean Tree* taking *Plane Figure* as your highest genus; and illustrate by reference to it the meaning of—

(1) Genus. (4) Infima Species.
(2) Summum Genus. (5) Differentia.
(3) Species. (6) Division by Dichotomy.

194. Examine the following arguments :—

(*a*) Men can reason without a knowledge of Logic; therefore the study of Logic is useless.

(*b*) If a man is prudent, he will not do evil deliberately, and if a man is strong, he will not do evil impulsively; therefore if he does evil, he must be either foolish or weak.

(*c*) A man eats either because he is hungry or because he is fond of eating; hence, if he eats when he is hungry, he is not fond of eating.

(C.)

195. How would you prove, inductively and deductively, that *Food is necessary to life?*

(C.)

196. Supply the assumptions, and examine the cogency, of the following arguments :—

(1) A riot must have been apprehended in Mallow last week, or they would not have sent for the police.

(2) War must be expected; for the price of wheat is daily advancing.

(C.)

197. Examine the following arguments :—

(1) Elementary education, being compulsory, ought to be free.

(2) The first five boats are not allowed to change their relative position; for I saw them come to the post six nights running in the same order.

(3) No one willingly does wrong; for wrong-doing certainly leads to misery, and no one desires to be miserable.

(4) If I accept the place offered me, I shall have more work; if I refuse it, I shall have less pay; but increased work and inferior pay are both evils; therefore I had better neither accept nor refuse it.

(O.)

198. Examine technically the following arguments :—

(*a*) None but undergraduates were in the gallery; and none but those in the gallery could hear; therefore none but undergraduates could hear.

(*b*) Few Englishmen have any political knowledge; all who have any political knowledge should have the franchise; therefore few Englishmen should have the franchise.

(*c*) All ragged persons must either *be* poor or wish to be thought poor: this ragged person wishes to be thought poor; therefore he is not poor.

(C.)

199. Distinguish between Experiment and mere passive Observation. In what consists the superiority of the former?

(C.)

200. What is meant by Scientific Explanation? Give illustrations.

(C.)

201. Explain and illustrate how *Inference* is involved in *Observation*, and how *Observation* is involved in *Experiment*.

(C.)

202. Distinguish between Term, Proposition, and Syllogism. Show how, using three, and only three, categorematic words, we may form with them either (1) a single Term, or (2) a Proposition, or (3) a Syllogism.

(C.)

203. What is the difference between an Index Classification and a Natural Classification?

(C.)

204. What is meant by Quality and Quantity of [Categorical] Propositions?

If an I proposition is given, what is known of the A, E, and O propositions in which the same pair of term [name]s appears?

(C.)

205. Point out some of the most important characteristics of a good observer.

(C.)

206. How would you define *Cause*? Would it be correct to assign as the Cause of a man's writing a book that he had plenty of time?

(C. shortened.)

207. How would you (*a*) explain,
(*b*) justify,
any belief—*e.g.* that every great general has a Roman nose, that it is unlucky to walk under a ladder, that water freezes at 32° F., that every isosceles triangle has the angles at the base equal?

208. Why does the thermometer stand so low in the hospital in summer?
(*a*) Because the air is so cool.
(*b*) Because of the good ventilation.
(*c*) Because it would not otherwise be healthy.
(*d*) Because the medical authorities have ordered it.
In what sense exactly are these *explanations*? Is there any common element in them all?

(C.)

209. What reasons might be given for treating of the Proposition before the Term in a system of Logic?

(O.)

210. Show, by examples, how Induction and Deduction are both implicated in the reasonings of common life.

(C.)

211. The fall of bodies and the planetary motions are said to be 'sufficiently explained' by being referred to the Law of Gravitation. Is this the case? How, and when, are we entitled to say that any phenomenon is sufficiently explained?

(C.)

212. Show that Logic requires a study of the import of Terms and Propositions.

(O.)

213. Examine the following:—
(1) If A is B, C is D;
If E is F, G is H;
But if A is B, E is F;
∴ If C is D, G is sometimes H.
(2) The crime was committed by the criminal;
The criminal was committed by the magistrate;
∴ The crime was committed by the magistrate.
(3) A dove can fly a mile in a minute;
A swallow can fly faster than a dove;
∴ A swallow can fly more than a mile in a minute.
(4) The ages of all the members of this family are over 150 years;
The baby is a member of this family;
∴ The baby is over 150 years.

(5) Athletic games are duties; for whatever is necessary to health is a duty, and exercise is necessary to health, and these games are exercise.

(Adapted from Stock, *Deductive Logic.*)

214. In Harriet Martineau's *Autobiography* (vol. i. p. 355) we are told that a certain lady, after receiving from Charles Babbage a long explanation of his celebrated calculating machine, terminated the conversation with the following question: 'Now, Mr. Babbage, there is only one thing more that I want to know. If you put the question in wrong, will the answer come out right?'

If you think this question absurd, give distinct and detailed reasons for thinking so, and reconcile them with the fact that false premisses may give a true conclusion.

(J.)

215. It has been said that much of what seems Observation is really Inference. Explain this, and illustrate by what are commonly called 'deceptions of the senses.'

(C.)

216. In what sense may we say that Genus is part of Species, and in what sense that Species is part of Genus?

(J.)

217. I am asked to believe that A will be elected out of fifty similarly equipped candidates; I am asked to believe, when the election is over, that A has been elected. Compare these cases with reference to the ground and measure of assent.

(C.)

218. Distinguish Observation from Experiment and from Inference.

(C.)

219. Write a short essay on the relation between Logic and Mathematics.

(C. shortened.)

220. Examine how far in Economics or in Politics it is possible to make use of the logical Method of Difference.

(C.)

221. Define Experiment, commenting upon the following statements:—

(*a*) We cannot set experiment over against observation as a new method of knowledge.

(*b*) We pass upwards by insensible gradations from pure observation to determinate experiment.

(*c*) Experiment must not be unqualifiedly set above mere observation.

(C.)

222. What is the general object of Mill's Methods of Induction? State the Method of Concomitant Variations, with an illustration.

(C.)

223. 'A good temper is proof of a good conscience, and the combination of these is proof of a good digestion, which, again, always produces one or the other.' Show (by Euler's diagrams or otherwise) that this is precisely equivalent to the following: 'A good temper is proof of a good digestion, and a good digestion of a good conscience.'

(C. modified.)

224. If Mr. X. is an author, authors are very agreeable.

INDEX AND VOCABULARY.

Absolute — *Cf.* under *Terms*, *Categorical Propositions*, and *Arguments*.
Abstract Name. According to Mill and other logicians, an Abstract Name (or Term) is the name of a quality, attribute, or circumstance of a thing. The antithetical term is *Concrete*.
Accidens—Cf. *Accident*.
Accident (Predicable)—Note II.
—— Inseparable—Note II.
—— Separable—Note II.
Added Determinants, Inference by—A kind of Immediate Inference (*EDUCTION*)[1] in which some fresh determination is added to the terms of the inferend, 94, etc.
Adjectives, 11.
Affirmative Conclusion with a Negative Premiss, 191, 201.
Agreement and Difference, Joint Method of — Cf. *Method of Agreement in Presence and Absence*.
Agreement in Presence and Absence, Method of—Cf. *Method of Agreement in Presence and Absence*.
Agreement, Method of — Cf. *Method of Agreement*.
All, 69, 71.
ALTERNATIVE (or Disjunctive) *MEDIATE INFERENCES*, 153-156.
—— Defined, 153.
—— Divided, 153-154, 156.
—— Canons of, 154-155.
ALTERNATIVE PROPOSITIONS, 52-57.
——, *CONTINGENT*, 54, 57.
——, *FORMAL* (or *SELF-CONTAINED*), 53, 54, 57.
——, *SELF-CONTAINED*—Cf. *Formal*.
——, *SUBSUMPTIONAL*, 53, 54, 57.
Ambiguous Middle Term — A Middle Term which has (or may have) a different application in one Premiss from what it has in the other; 119, 188, etc., 201.
Ambiguous Term, 172.
Ampliative Proposition—A Categorical Proposition in which the signification of the Predicate is not included in that of the Subject—opposed to Essential or Verbal, or Explicative, or Analytic Proposition. Ampliative Propositions are called also Real or Synthetic.
Analogy, 146.
Analysis—the operation of breaking up a whole into parts—opposed to Synthesis. The process of discovering *laws* by examination of *facts* is frequently described as analytic. Hence it is said that the Method of Analysis is the Method of Discovery.
Analytic Proposition — Cf. *Essential Proposition*.
Antecedent—(1) An event which precedes another is an antecedent to that other; (2) The

[1] New Technical Terms are printed in italic capitals.

first clause of a Hypothetical or Conditional Proposition is called its Antecedent, 42, etc.

Any, 69-71.

Application of Names and Terms, 5, 6, 20.

posteriori knowledge—Knowledge obtained from experience either (1) originally—as, *e.g.*, the knowledge we have that vaccination is a preservative against small-pox, or (2) by fresh appeal to experience, as I may know by *now* rubbing two pieces of wood together that heat is a consequent of friction.

A priori knowledge—Knowledge not obtained by experience—either (1) not at all, as, the knowledge that *A is B or not B*; or (2) not by fresh appeal to experience, as, the knowledge we *now* have that vaccination is a preservative against small-pox.

Arbor Porphyriana — Cf. *Tree of Porphyry.*

Argument — Cf. *Mediate Inferences.*

—— An Argument (or Mediate Inference) consists of three Propositions, of which two are called the Premisses, and the third the Conclusion. The Conclusion is inferred from the Premisses taken together.

Argument—*à fortiori*, 14, 34, 37, 130-131.

Argument—Relative Categorical, 80, 129-132.

—— —— Canon of, 132.

Arguments, Absolute (cf. *Syllogism*)—An Absolute Argument (or Syllogism) is an Argument that is formal, or of absolutely general validity, by virtue of its mere form. Thus *M is P and S is M*, ∴ *S is P*, is an Absolute Argument, because the reasoning holds, no matter what words or symbols we put in the place of M, P, and S. *Cf.* pp. 80, 114, etc.

Arguments, Relative—A Relative Argument is an Argument that is not in a form which is of absolutely general validity. This characteristic follows, of course, from the fact that the cogency of any Relative Inference depends upon the constitution of the system to which it refers. *Cf.* pp. 80, 114.

Argumentum ad hominem—An argument that has a special application to a given individual. The name is sometimes applied to a valid argument, which starts from premisses admitted by the person to whom it is addressed—cf. *Argumentum ex concesso*; sometimes to a more or less fallacious argument, of the kind called Irrelevant Conclusion. To attack an opponent's character instead of answering his reasons, is a fallacy of this kind.

Argumentum ad judicium — An appeal to judgment or common sense.

Argumentum ad verecundiam—An appeal to modesty or reverence.

Argumentum ex concesso—An argument which starts from what has been admitted or conceded.

Aristotelian Induction—Cf. *Perfect Induction.*

Aristotle's *Dictum*—Cf. *Dictum de omni et nullo.*

Assertion — An Affirmation or Denial.

Assumption—A Proposition which is taken for granted, without being either self-evident or proven.

Axiom—A Self-evident Principle, a Proposition which is both fundamental and self-evident. 'There seem to be four conditions, the complete fulfilment of which would establish an apparently self-evident proposition in the highest degree of certainty attainable'; it must '(*a*) have the terms clear and precise; (*b*) be really self-evident; (*c*) not conflict with any other accepted proposition; (*d*) be supported by a concensus of experts.' *Cf.* Sidgwick, *Methods of Ethics*, Bk iii. Ch. xi.

Basis of Division—the point or points upon which a division is based. *E.g.* in the division on p. 161 the Basis of Division of (1) into (2), (3), and (4) is *comparative length of sides.*

Bramantip, *Celarent*, etc., 123.

Categorematic (p. 85)—A word is Categorematic if it can be used as the Subject or Predicate of a Categorical Proposition.

Category (or Predicament)—'A term (meaning literally "Predication" or "Assertion") given to certain general classes of terms, things, or notions; the use being very different with different authors' (Murray's *New English Dictionary*). Aristotle enumerates ten Categories: Substance, Quantity, Quality, Relation, Action, Passion, Where, When, Posture, Habit. Mill understands by the Categories the *Summa Genera* of nameable things; his Categories are: Feelings, Minds, Bodies, Certain Relations of Feelings (Co-existences, Sequences, Similarities, and Dissimilarities). Kant's four chief Categories are Quantity, Quality, Relation, and Modality, corresponding to the different forms of judgment.—The Categories indispensable to Assertions, Inferences, Classing, and Systematising are—(1) Identity in Diversity; (2) Similarity in Otherness; (3) Unity of Parts and Whole; these may therefore be called the principal Logical Categories.

Categories, 74, 75, 211.

Categorical Propositions, 20, 41.

—— Import of, 20 *seq.*, 62-64.

—— Classification of, 30-32, 33.

—— *COINCIDENTAL*, 30.

—— *ADJECTIVAL*, 30.

—— Whole, 30.

—— Partial (or Particular), 30.

—— *ATTRIBUTE*, 30.

—— *SUBSTANTIVAL*, 33.

—— *PROPER* and *UNIQUE*, 30.

—— *SPECIAL*, 30, 33.

—— *COMMON*, 30.

—— Universal, 30.

—— General, 30, 32.

—— Definite, 30, 31.

—— Indefinite, 30, 31.

—— Absolute, 14, 30, 31, 36.

—— Distributive, 30, 31.

—— Collective, 30, 31.

—— Affirmative, 31, 33.

—— Negative, 31, 33.

—— Mathematical, 14, 37-41.

—— Relative, 14, 30, 31, 34-41.

—— —— Analysis of, 36.

Categorical Mediate Inferences (Categorical Arguments), 114-132.

—— Definition of, 114.

—— Divisions of, 87, 114.

Categorical Syllogisms, Canon of, 116.

—— Application of Canon of, 116-117.

—— Rules of, 118.

—— Breaches of Rules of, 118, 119. Cf. *Fallacies.*

CATEGORICO - ALTERNATIVE ARGUMENTS, 153, etc., 156.
Cause and Effect—If any conjunction CX is related to any change E in such a way that CX cannot occur without E, nor E without CX: then CX is cause of E, and E is effect of CX—135.
Chain-Argument—Cf. *Sorites.*
Character, 5, 6, 20.
Circular Definition (*Circulus in Definiendo, Vicious Circle*)—A Circular Definition (including *Tautological Definition*) is a definition which merely repeats the word to be defined, or brings us back to it, 66, 67, 168, 184.
Circulus in Probando (*Circular Fallacy, Begging the Question*), 197-199.
Circumstantial Evidence — 'Indirect Evidence inferred from circumstances which afford a certain presumption, or appear explainable only on one hypothesis' (Murray's *New English Dictionary*).
Classification, 158, 159 *seq.*, 162.
—— Rules of, 161.
—— Artificial—An Arrangement of Classes which is for some special purpose and is not obviously suggested by the things classified. It is opposed to Natural Classification, which is useful for general purposes, and is suggested by the things themselves. The terms Artificial and Natural as applied to Classification might with advantage be replaced by the terms General and Special, for *all* Classification (*cf.* p. 164) is to some extent artificial, as being made by man for his purposes, and also to some extent natural, because it must be in accordance with the nature of the things classified.
Classification by Type—In this phrase Classification is used in the sense of *Classing*. It was held by Whewell that natural groups are given not by Definition but by Type, *i.e.* by reference to 'an example which possesses in a marked degree all the leading characters of the class.' In classing by type the appeal is rather to general resemblance than to the possession of a fixed list of characteristics.
Classification by Series — This phrase is used to indicate an arrangement of things in which the classes are so grouped with reference to some characteristic or group of characteristics, that they present a kind of hierarchy of classes. *E.g.* in Zoology, any class is higher in the classification in proportion as it is held to have more or fuller life.
Classification, Index—Cf. *Index Classification.*
Classing, 75, 158, 161-162.
—— and Definition, 158, 168-169.
—— (as well as Classification) may be Natural or Artificial, General or Special.
Collective Term—A Term which, in the singular number, applies to a plurality of objects of the same kind, *e.g.* library, army, school. (The antithetic term is *Non-collective.*)
'Collective use' of Terms.—A Term used collectively applies to the whole only, and not to the separate constituents, of a group or class. The antithetic term is 'Distributive use.' The distinction between 'Collective use' and 'Distributive use' is appropriate only in reference to plural Terms, 30, 31.

Colligation of Facts—A phrase used by Whewell to signify the connecting or systematising of facts by some suitable hypothesis or notion.
Combination of Causes—An intermixture of causes producing a Heteropathic Effect.
'Combined' ('Complete') Method (= Mill's *Hypothetical M.*)—Note v.
Complementary Premisses—Two Propositions, from which, taken together, a Conclusion may be drawn, 72. Cf. *Premissal Propositions.*
'Complete Induction'—Cf. '*Perfect Induction.*'
Complex Conception, Inference by —This is a kind of Immediate Inference, in which Terms that have the same application are made more complex, 93, 94, 95.
Complex or Intermixed Effect—An effect which results from the conjunct action of two or more causes.
Composition of Causes—An intermixture of Causes producing a Compound Effect.
Compound Effect—A Complex Effect which is equivalent to the sum of the separate effects. (*Cf.* Parallelogram of Forces.)
Comprehension—Cf. *Connotation.*
Conceptualist view of General Names. On this view, there corresponds to every General Name a General Notion in the mind, which is the 'mental equivalent' of the name, and applies equally to all the particular objects called by the name. *Cf.* Section xvii., 175, etc.
Conclusion, 86, 115.
Concomitance, 135.
Concomitant Variations, Method of—Cf. *Method of Concomitant Variations.*
Concrete Name—According to Mill and later logicians, a Concrete Name is the name of a thing. Cf. *Abstract Name.*
CONDITIO - ALTERNATIVE —Cf. *Inferentio-Alternative.*
CONDITIO - CATEGORICAL Argument, 150, 152.
Confusion and Fallacy, 178 *seq.*
Conjunctions, force and justification of, 75-77.
Connotation—By Connotation of a Name 'we mean the attributes on account of which any individual is . . . called by the name' (Dr. Keynes). Dr. Keynes suggests differentiating the terms (1) Connotation, (2) Intension, (3) Comprehension, as follows:—(1) = the attributes implied or signified by a name; (2) = the attributes mentally associated with the name, whether or not they are actually implied by it; (3) = all the attributes possessed in common by all the objects denoted by the name.
Connote—Cf. *Connotation.*
Consequent—(1) Of two successive events, the later is consequent to the earlier; (2) The second Clause of a Hypothetical or Conditional Proposition is called its Consequent, 42.
Consilience of Inductions—This is a phrase of Whewell's, applied to the case in which a plurality of Inductions support the same Hypothesis.
Constituent Class—Any one of a plurality of sub-classes which *constitute* a wider class. The wider class so divided is a Genus of which the sub-classes are Species, 160, 161.
Constituent Species — Cf. *Constituent Class.*
Constructive Syllogism—Cf. *Modus Ponens.*

Continuity, Law of—This expresses the principle that every change is a continuous process, that there can be no gap or skipping in passing, *e.g.* from one degree of temperature, or one time, or place, or size, to another. The same principle is expressed in the saying, *Natura non facit saltum* (or *Natura non agit per saltum*).

Contradiction, Law of, 206, 208-209.

—— —— is the Principle of Consistency, 209.

Contradictories—Note I.

Contradictory—Two propositions are contradictory (*a*) when one is the negative of the other; (*b*) when they are A and O, or E and I (which are mutually exclusive and together exhaustive), 108, 109.

Contraposition, Contraposit—Cf. *Contraversion, Contravert.*

Contrary, Contraries, 108, 109, Note I.

CONTRAVERSE—The proposition reached by Contraversion.

CONTRAVERSION (Contraposition), 88, 96-97; 94, note: 101-102, 104-105, 107.

CONTRAVERT (Contraposit), to perform the process of Contraversion.

CONTRAVERTEND—The Proposition to be contraverted.

Converse—The proposition reached by Conversion.

Conversion, 32, 88, 89-90, 99-100, 103, 107.

Conversion per Accidens—Conversion of A to I.

Conversion by Negation—Same as *Contraposition.*

Conversion and Quantification, 58-66.

Convert—To perform the process of Conversion.

Convertend—The proposition to be converted.

Co-ordinate Classes — Constituent Classes belonging to the *same stage* of a division, 161.

Copula, 5, 8, 9, 16-17.

Correlative Terms—Terms which have a certain special relation to each other, the thing referred to by one member of a pair of correlatives implying also the thing referred to by the other member—as, *e.g.*, in Sovereign and Subject, Whole and Part.

Criterion—A standard or test by which to judge.

Cross Division—A division in which Constituent Classes overlap, 161, 184.

DATA—Statements given or accepted.

Deduction, 81-85, 87, 120, etc., 133-134.

—— Meaning of, 81.

'Deductive Method' of Induction —Note V.

—— —— Abstract—When the Deductive Method is applied in sciences that are not concerned with Causation (*e.g.* Mathematics), it is called by Mill the Abstract Deductive Method.

—— —— Concrete—Mill gives this name to the Deductive Method when it is applied in sciences that are concerned with phenomena of Causation—*e.g.* Sociology, Medical Science.

—— —— Direct—Cf. *Inverse D. M.* In this application of the Deductive Method, we first reach a conclusion by deduction from the results of previous Inductions, and then verify by comparison with experience. Note V.

—— —— Inverse—In this application of the Deductive Method 'we obtain our law more or less conjecturally by direct experience, and afterwards verify it by showing that it is deducible from more general or better known laws.'

De facto—What is *actually* or *in fact.*

De jure—What ought to be, what is *legally* or *by right.*

Definition, 158, 160, 163 *seq.*

—— and Language, 163-177.

——, Rules of, 168.

—— Defined, 163.

—— and Recognition, 164-166.

—— (Predicable)—Note II.

—— Accidental—Cf. *Description.*

—— Genetic—'An indication of the way in which the *mental picture*' of the thing to be defined 'may or must be formed. "Let a straight line revolve in one plane about one of its extremities, and combine the successive positions of the other extremity"—that is a Genetic Definition of a circle' (Lotze).

Demonstration—Absolute Proof (or Unquestionable Evidence).

Denial (Contrary and Contradictory), 109.

Denotation—By Denotation of a name is meant the individuals to which the name applies.

Denote—Cf. *Denotation.*

Depth—Cf. *Connotation.*

Description—An account of anything which is not precise enough to be called a Definition, but which is sufficient to mark off the thing described from other things.

Destructive Syllogism—Cf. *Modus Tollens.*

Desynonymization — The term used by Coleridge for *Differentiation*, which see.

Determination—Distinguishing or limiting by addition of characteristics. *E.g.* when I qualify the term *flower* by the adjective *red*, *flower* has undergone Determination.

Dictum de omni et nullo, 93, 123, 123 note.

Difference — means (1) Distinctness or Otherness; (2) Diversity.

—— Method of—Cf. *Method of Difference.*

Differentia (Difference) — The characteristics by which any sub-class (or species) is distinguished (*differenced*) from the rest of its wider containing class (or Genus), 160, Note II.

Differentiation of Terms — The specialising process by which words originally synonymous come to have a different use and application—*e.g. big, large, great.*

Dilemma—A Dilemma is an Inferentio-Alternative Argument, having a Compound Inferential Major, an Alternative Minor, and a Conclusion which is either Alternative or Categorical. In a strict Di-lemma the Minor Premiss contains only *two* Alternatives. Cf. *Inferentio-Alternative Argument*, 154.

—— Complex — In a Complex Dilemma the Conclusion is Alternative.

—— Simple—In a Simple Dilemma the Conclusion is Categorical.

—— Constructive—In a Constructive Dilemma the Conclusion is Affirmative.

—— Destructive—In a Destructive Dilemma the Conclusion is Negative.

Disjunctive. See *Alternative.*

Dissimilarity, Principles of, 147, 207.

Distinctness (= Otherness)—There is *Distinctness* between any *two*

objects—if A is not B, then A is *distinct* from B.

Distributed Term—A term is said to be *distributed* if it is taken universally, *i.e.* if *the whole* of the class or group to which it refers is explicitly taken. *E.g.* A in *All A* is distributed, in *Some A*, undistributed. In Affirmative Categorical Propositions the Predicate-name is undistributed; in negatives, the Predicate-name is distributed.

'Distributive use' of Terms — A term is used distributively when it applies to the separate constituents of the group or class to which it refers—(Cf. *Collective use*), 30, 31.

Diversity, Diverse — There is Diversity between *two* things when they are unlike each other; and between two states of the *same* thing, if the thing has altered. *Cf.* 20-25 *passim*, 29.

Division, 158 *seq.*

—— Rules of, 161.

—— and Classification, 158, 159-161.

—— by Dichotomy. Note II., p. 217.

EDUCE, EDUCEND, EDUCT, EDUCTION, defined, 86 (*cf.* 108).

EDUCTIONS (Immediate Inferences), 88-107.

Effect—Cf. *Cause and Effect.*

Elimination—Removing or dropping out Elements or Constituents. Elimination is usual in processes of Mediate Inference—*e.g.* in the Syllogism *M is P and S is M* ∴ *S is P*, the term M is dropped out in the conclusion. By *Elimination of Chance* is meant calculating and leaving out of account, in any inquiry, the influence of casual factors.

Elliptical Arguments—Note IV.

Empirical Law—A Law crudely generalised from experience, and asserting an interdependence (*cf.* Section xiii.) which is neither self-evident, nor proved by the Inductive Methods—a sort of *quack* Law. Cf. *Induction by simple enumeration.*

—— Method—The method of unreasoned appeal to experience. A method in which there is crude and unjustified generalisation from facts.

Enthymemes—Note IV.

—— of the First Order;

—— of the Second Order;

—— of the Third Order — *Cf.* Note IV.

Enumeratio Simplex—Cf. *Induction by Simple Enumeration.*

Epicheirema—Note IV.

Epi-syllogism—Note IV.

Equal, 38, 41.

Equipollent—Cf. *Equivalent.*

Equivalent—Definition of, 85, 86.

Equivalent Propositions—Propositions which are reciprocally inferrible, 72.

Equivocal Terms—Cf. *Ambiguous Terms.*

Essential Proposition—A Categorical Proposition in which the Predicate repeats all or part of the signification of the subject. Essential Propositions are called also Analytic and Verbal. The term *Verbal* seems specially applicable to propositions in which the Predicate is a Definition or a Synonym of the Subject.

Euler's Diagrams—Circular Diagrams such as are used at p. 25, etc., are so called, because used by Euler, a Swiss logician of the last century.

Event—Change in Subjects of Attributes, 136.

EVERSIONS, 80, 88; Categorical, 89-99, 107; *INFERENTIAL*, 99-103, 107; *ALTERNATIVE*, 103-105, 107.

Example, Argument from—This consists in arguing from a sample to the whole, and except in the case of mathematical examples, is not a cogent mode of inference.

Exceptive Proposition—A Categorical Proposition of the form *All A, except B, is C.*

Excluded Middle, Law of, 204, 209.

—— —— a Principle of Completion, 209.

Exclusive Proposition—A Categorical Proposition of the form *A alone are B, Only C are D, None but X are Y*, etc.

Exhaustive Division—A Division which includes every possible case. Division by Dichotomy is sometimes called Exhaustive Division.

Existence, 5, 6, 20.

Experiment—An Experiment is made when certain conditions of an event are purposely arranged in a certain way, and then the event so conditioned is observed.

Experimentum Crucis—A Crucial or Decisive Experiment.

Explanation — In the broadest sense Explanation of any fact or statement may be described as *showing its connection with some other facts or statements.* Explanation is often used in the narrower sense of *showing the cause* of anything. *Explanation* is to be carefully distinguished from *Justification.*

Explicative Proposition — Cf. *Essential Proposition.*

EXTRAVERSION — A kind of Eduction in which from the modification of one of two terms which have identical application, we infer a precisely similar modification of the other term, 88, 94-96, 96 note, 101, 104, 107.

Extremes of a Categorical Proposition—Its ends or *termini*—*i.e.* the Subject and Predicate.

FALLACY, 118-119, 178-201.

—— Definition of, 183, 184.

—— Division of, 178-199 *passim*, 200, 201.

—— *ABSOLUTE*, 178-199 *passim*, 200, 201.

—— of Accent—A case of mistake which arises from accentuating the wrong word in a sentence.

—— of Accident (*A dicto simpliciter ad dictum secundum quid*), 179, 181.

—— ——, Converse (*A dicto secundum quid ad dictum simpliciter*), 179, 181.

—— *ALTERNATIVE* (or Disjunctive), 186-187, 195-197, etc., 200, 201.

—— of Ambiguous Middle, 118, 119, 188, 201.

—— of Amphibology (or Amphiboly), 179.

—— of the Antecedent — This consists in *denying* the Antecedent in an Inferentio-Categorical Argument, 194.

—— of Arguing from one special case to another special case (*A dicto secundum quid ad dictum secundum alterum quid*), 180.

—— of *Argumentum ad populum* —This is a species of the Fallacy of Irrelevant Conclusion, and consists in an appeal to the sentiments rather than to the reason of any collection of persons to whom it is addressed, 183.

—— Categorical, 185, 187-193, 198, etc., 200, 201.

Fallacy of Composition, 179, 180.
—— of the Consequent — This consists in *affirming* the Consequent of an Inferentio-Categorical Argument, 195.
—— of Continuous Questioning (or *of Many Questions*), 178-179.
—— of Definition, 184.
—— of *DISCONTINUITY* — In Fallacies of Discontinuity there is a breach of the ostensible connection upon which the meaning or validity depends, 183, 184, 185, etc., 200, 201.
—— of *TAUTOLOGY*—In Fallacious Tautology there is mere *repetition* under the guise of difference. Tautological Fallacies of Categorical Syllogism are excluded by the definition of Syllogism — 183, 184, 185, etc., 200, 201.
—— of Division, 179-180.
—— of Division and Classification, 184.
—— of *EDUCTION* (or Immediate Inference), 180, 181, 182, etc., 184, 185-187, 200, 201.
—— *ELEMENTAL*, 183, 184, 200.
—— of Equivocation, 179-180.
—— *EVERSIVE*—These are Fallacies of Immediate Inference (or Eduction) which occur in passing from a given proposition to another proposition of the same form, *e.g.* from a Categorical to a Categorical, 185, etc.
—— of False Cause (*A non Causa pro Causa*, *Post hoc ergo propter hoc*). In this Fallacy, Causation is inferred from mere Antecedence, 181-182.
—— of Figure of Speech—A Fallacy which arises from mistaking one part of speech for another, or a word of *first intention* for a word of *second intention*, etc.
Fallacy, Formal—Cf. *Absolute Fallacies*.
—— of *FOUR TERM-NAMES*, 187, etc., 201.
—— of Illicit Major—Here the Major Term is distributed in the Conclusion but not in the Premisses, 119, 191, 201.
—— of Illicit Minor—Here the Minor Term is distributed in the Conclusion but not in the Premisses, 119, 190-191, 201.
—— of *INCONSISTENT PREMISSES*, 187, 190, 201.
—— *INFERENTIAL*, 185-186, 193-195, 198-199, 200, 201.
—— of Irrelevant Conclusion (*Ignoratio Elenchi*) — In this Fallacy the Conclusion is proved, but it is a Conclusion more or less different from the one which ought to have been proved, 182, 183.
—— of Judgment—Cf. *Elemental Fallacies*.
—— 'Logical'—Fallacies which break the laws of Assertion or Inference. *Cf.* Section xviii. *passim*, and Tables xi. and xii.
—— 'Material'—Fallacy of Accident, Converse Fallacy of Accident, Irrelevant Conclusion, Petitio Principii, Non Sequitur, False Cause, Fallacy of Many Questions, etc., have been called Material Fallacies, as opposed to the so-called Logical and Semi-Logical Fallacies. Section xviii., 178-184.
—— of *NO TRUE MIDDLE TERM*, 118, 119, 181, etc., 187-189, 201.
—— of Negative Conclusion from Affirmative Premisses, 191, 201.
—— of *Non-Sequitur* — In this Fallacy, the Conclusion does not follow from the Premisses, 181, 187, 190.
Fallacy of *Petitio Principii*—This is a Circular Fallacy, a Fallacy which occurs when, in the attempt to prove an assertion, recourse is had to some proposition which that assertion itself has contributed to prove, 197-199.
—— of *REDUNDANT TERMS* —Cf. *Fallacies of Discontinuity*, 180, 181, 201.
—— *RELATIVE*, 199, 200.
—— 'Semi-Logical'—The Fallacies which have been so called are those of Equivocation, Amphibology, Composition, Division, Accent, Figure of Speech.
—— Syllogistic (included in *Fallacies of Mediate Inference*), 184-185, 187-199, 200, 201.
—— *TRANSVERSIVE*—These Fallacies of Immediate Inference (or Eduction) occur in passing from a given proposition to a proposition of a different form, *e.g.* from a Categorical to an Inferential, 185, etc.
—— of Undistributed Middle—Here there is no true Middle Term, because the Middle Term-name has *some* for Term-Indicator in both Premisses, 188 (*b*), etc., 201.
Fallacious Questioning—Cf. *Fallacy of Continuous Questioning*.
Few, meaning of, 69.
Figure, 122 *seq.*, 160.
—— Definition of, etc., 122 *seq.*
Form—This expression as used by Francis Bacon signifies an invariable co-existent which he supposed to accompany every property of an object, 205-206. *Cf.* 137.
Formal, Meaning of, 80.
'Formal Induction'—Cf. '*Perfect Induction.*'
Fundamentum divisionis — Cf. *Basis of Division.*
Fundamental Syllogism—A Categorical Syllogism in which there is no unnecessary distribution of terms in the premisses. Cf. *Strengthened Syllogism.*

GALENIAN FIGURE — The fourth figure of Syllogism is sometimes so called, after Galen, who is supposed to have first recognised it.
General Classification—Cf. *Classification, Natural.*
Generalisation—The change in a Term, by which its Application is extended or widened; the verb *to boycott* is a recent example. Cf. *Specialisation.*
Generic—Relating to, or belonging to, a Genus.
Genus—A class considered as containing smaller classes, 160, 161; one of the Predicables, Note II.
Genus Generalissimum—Cf. *Summum Genus.*
—— Proximate (or *Proximum*)—The Proximate Genus of any Class is the next wider class in which it is contained, 160, 161, Note II.
——, *Summum*—The widest Class with which we are concerned in any given case, 160, 161, Note II.

HETEROGENEITY, LAW OF—This Law asserts that any two things, however similar, must be dissimilar or heterogeneous in some respects. This is equivalent to Leibnitz's principle of the *Identity of Indiscernibles*, and to one of the *Laws of Similarity* given on pp. 147 and 207, namely, that 'No two things have *all* characteristics similar.'

Heterogeneous—Of various kinds.
Heteropathic Effect—A Complex Effect in which the joint effect is different from the sum of the separate effects.
Highest Class—Cf. *Summum Genus*.
Homogeneity, Law of—This Law asserts that the most dissimilar things must be similar (or homogeneous) in *some* respects. It is expressed in one of the *Laws of Similarity* given on pp. 147 and 207, viz. 'No two things have *all* characteristics different.'
Homogeneous—Of the same kind.
Homonymous Terms—The same as *Ambiguous Terms*.
Hypothesis—Something which is supposed, a conception or theory, 148.
Hypothetical Argument—150, 152.
HYPOTHETICO-ALTERNATIVE—Cf. *Inferentio-Alternative*.
Hypothetico-Categorical Argument—150, 152.

IDENTICAL — Numerically the same, the same individual—*numero tantum* (antithetic to *distinct*, *other*, etc.).
Identity—The Numerical Sameness, or continued existence, of one thing or group (antithetic to *Distinctness*, *Otherness*—compare 'Mistaken identity') 20-25 *passim*; 29, 36, 41.
Identity in Diversity, 20 *seq.*, 74, 75, 203 *seq.*, 211.
—— Law of, 202, etc., 206, 207.
—— —— Is the Principle of the possibility of significant assertion, 209.
—— —— Its relation to Inference, 75, 210, 211.
Identity of Indiscernibles—The principle recognised by Leibnitz, and known under this name, embodies the view that no *two* things can be alike in *all* points (if they were, how should we know them to be *two*?)—207. Cf. *Law of Heterogeneity*.
Illation = Inference.
Illative = Inferrible.
Imperfect Figures—Figures 2, 3, 4 of the Categorical Syllogism are so called.
Inconsistent Propositions. Cf. *Incompatible Propositions*.
Indesignate Propositions — Categorical Class - Propositions, of which the Subject is unquantified (sometimes called 'Indefinite').
Index Classification—A systematic grouping which is made for purposes of reference—*e.g.* the alphabetical grouping of words in a dictionary, or an ordinary book-index.
Inductio per Enumerationem simplicem—Cf. *Induction by Simple Enumeration*.
Induction, 81-85, 87, 133-149.
—— Meaning of, 81.
—— Justification of, 135 *seq.*
—— Mathematical, 141.
—— Principle of—Cf. *Principle of Interdependence*.
—— Differentia of, 147.
—— Analysed, 145-146, 148.
—— Practical maxim of, 147.
—— by Simple Enumeration—An empirical procedure, in which we generalise from the mere enumeration of one or more cases to a universal statement. Cf. *Empirical Law*.
Inductive Argument, 32, Section xiii.
'—— Syllogism,' in the sense of a Syllogism expressing a 'Perfect Induction.' *Cf.* Note III.
—— Methods, 139-144.
—— —— The assumptions on which they are based, 144, 209-210.

Inductive Methods, Their function, 210.
—— —— Mill's Canons of—Note VI.
Infer, Inference, Inferend, Definition of, 86.
Inference from Whole to Parts and from Parts to Whole, 74.
Inferences, 31, 79-87.
—— Definitions of, 79, 85, 86, 88, 114.
—— Immediate (Cf. *Eductions*), 79-80, 88-107.
—— Mediate, 80-85, 114-156.
INFERENTIAL MEDIATE INFERENCES, Definition of, 150.
—— Division of, 150, 152.
—— Canons of, 150-151.
INFERENTIO-CATEGORICAL ARGUMENTS — These include Hypothetico-Categorical and Conditio-Categorical Arguments.
INFERENTIO-ALTERNATIVE ARGUMENTS, 153, etc., 156.
Intension—Cf. *Connotation*.
Intention, Names of First and Second—In the terminology of Scholastic Logic, a name is of the First Intention if it is the simple direct name of the object to which I apply it. *E.g.* if I say *That is a cow*, cow, as so used, is a term of First Intention. But if, considering the logical character of *a cow* in the above sentence, I say that it is a Predicate, or a Predicable, then I am regarding it as a name of Second Intention.
Interdependence, 135 *seq.*
—— Principle of, 135.
—— Proof of, 139 *seq.*
Inter-relation, Principles of, 210-211.
Inter-relation of things, 204, etc.
INTRAVERSE, INTRAVERSION, 90, 107.
Inversions, 88, 97-98, 102, 105, 107.

JUDGMENT—An Assertion.
Justification may be described as *showing that a thing is right*, or is *what it ought to be*. An action is *explained* if, *e.g.*, its *cause* is given; it is *justified* if it is shown to be *right*.

LANGUAGE, Definition and—163-177.
—— Growth of, 171-172.
—— An Ideal, 172.
—— Ambiguity of, 172-176.
Law of Concomitance of Characteristics, 135, 209.
—— of Causation of Events, 135, 209.
—— of Heterogeneity, 207.
—— of Homogeneity, 207.
Likeness—Cf. *Similarity*.
Limitation, Conversion by—The Conversion of A to I is so called. Cf. *Conversion per Accidens*.
Logic, Scope of, 2, 3.
—— Definition of, 3.
—— Assumptions of, 3.
Lowest Class—Cf. *Infima Species*.
Lowest Species — Cf. *Infima Species*.

MAJOR Term, 115.
—— —— Illicit Process of, 119.
Mathematical Axioms, 206.
—— Inductions, 141, 206.
Mediate Inference (Argument), Definition of, 114.
Mediate Inferences, Inferential—Cf. *Inferential Mediate Inferences*.
—— Alternative—Cf. *Alternative Mediate Inferences*.
Membra Dividentia—Cf. *Co-ordinate Classes*.
'Mental Equivalents' of Names, 175-177.

Metaphysical Division—An enumeration of the co-inherent characteristics of any object has been so called. *E.g.* A rose may be 'metaphysically divided' into colour, form, size, and fragrance.
Method, 157 *seq.*
—— Rules of, 157-158.
Method of Discovery — Cf. *Analysis.*
Method of Instruction—Cf. *Synthesis.*
'Methods of Experimental Inquiry'—This is the name given by Mill to the Methods of Inductive research formulated by him under the names of Method of Agreement, Joint Method, Method of Difference, Method of Residues, Method of Concomitant Variations. Mill's *Canons* of these methods are given in Note VI. The treatment of *Inductive Methods* in Section xiii. differs somewhat from Mill's.
Method of Agreement, 139, 140. Note VI.
—— —— in Presence and Absence, 139-140 (Joint Method of Agreement and Difference, Indirect Method of Difference. Note VI.).
Method of Difference, 141-143. Note VI.
——of Residues, 143-144. Note VI.
—— of Concomitant Variations, 144. Note VI.
Middle Term, 115.
—— Absence of, 118, etc.
Minor Term, 115.
—— Illicit Process of, 119.
MIXED ALTERNATIVE ARGUMENT, 153, 156.
—— *INFERENTIAL ARGUMENT*, 150-152
Mnemonic Verses (*Barbara, Celarent*, etc.), 122, 123.
Modal Proposition (as distinguished from a Pure Proposition) means (1) one in which the Predicate is asserted *cum modo*, some adverb of time, place, manner, etc., being attached to the copula. *E.g. A is always B, X is generally Y*; (2) A Modal Proposition means one in which there is an explicit indication of the degree of certainty or probability with which the proposition is asserted. *E.g. A is necessarily B, X is possibly Y.*
Modus Ponendo Tollens — The mood which by affirming denies —the form of Categorico-Alternative Argument in which the Minor is affirmative and the Conclusion negative.
Modus Tollendo Ponens, the mood which by denying affirms—The form of Categorico-Alternative Argument in which the Minor is negative and the Conclusion affirmative. This is not a cogent form of argument.
Modus Ponens—The constructive form of Mixed Inferential Argument, *i.e.* that in which Minor and Conclusion are affirmative propositions. The Syllogism on p. 50 and the third Syllogism on p. 49 are of this form.
Modus Tollens—The destructive form of Mixed Inferential Argument, *i.e.* that in which Minor and Conclusion are negative. Cf. *Modus Ponens.*
Mood and Figure, Importance of Distinctions of, 120-121.
Mood, Definition of, etc., 121-122 *seq.*
Most, meaning of, 69.

NAME, 5.
—— Distinguished from *Term*, 5.

Name, Definition of, 5.
—— Twofold Function of, 5, 6, 20.
—— Distinctions of, 10, 11.
—— Divisions of, 6, 9, 12.
—— Table of, 18.
—— Common, 12.
—— Proper, 6, 7, 12.
—— *MIXED*, 7.
—— *INDIVIDUAL*, 7, 8.
—— *ATTRIBUTE*, 11, 16.
—— *SPECIAL*, 8, 12.
—— *SUBSTANTIVE*, 12.
—— *UNIQUE*, 12.
Natural Classification—Cf. *Classification, Artificial.*
'Natural Group' (or 'Real Kind') —Applied by Mill to 'those classes which are distinguished from all others, not by one or a few definite properties, but by an unknown multitude of them; the combination of properties on which the class is grounded being a mere index to an indefinite number of other distinctive attributes.' (It might be maintained that this account would apply to *every* class.)
egative Instances — *Cf.* 224, *Canon of Joint Method of Agreement and Difference*—'instances in which the phenomenon does *not* occur.'
Negative Terms—A Term with a negative meaning, or negative prefix, is called Negative. When two correlated terms are negatives of each other they are related as *B* and *not-B*. *E.g. White, not-White* are correlated negatives.
Nomenclature — A Collection of Names of the distinct objects and classes which are treated of in any science. *E.g.* Roses, Dandelions, Oaks, Beeches, are part of the Nomenclature of Botany.
Nominalist Doctrine of General Names—On this view there is no Real Universal corresponding to General Names (as on the Realist Hypothesis), and no General Notion in the mind (as on the Conceptualist View); but the only generality in the case is the *general application* of the name itself to the particular individuals which are called by the name.

OBSERVATION means simply watching, noting, or taking account of; it is often used in the special sense of Scientific Observation —that is, Observation for purposes of Science.
Obverse—The Proposition reached by Obversion.
Obversions, 88, 91-93, 100, 103, 107.
Obvert—To perform the process of Obversion.
Obvertend—The Proposition to be obverted.
Opposite (or Contrary) Terms—When two terms have the most extremely opposite meaning possible, they are called Opposite or Contrary, *e.g.* Black and White. Compare *Negative Terms.*
'Opposition' of Propositions—Note I.
—— Square of—Note I.
Ostensive (or Direct) Reduction, 124.
OTHERNESS (= Distinctness), 20, 23-25, 29.

P—used for *Predicate of a Categorical Proposition*, 9, 24, etc.
Paradox—A Statement contrary to common opinion.
Parallelogram of Forces—Note V.
Paralogism—A 'Logical' or Formal Fallacy.
Parcimony, Law of—asserts that

'we ought always to make as few assumptions as possible.'
Partition or Physical Division—Distinguishing a material object into its parts—*e.g.* a violet-plant into root, stalks, leaves, and flowers.
Perfect Figure—Figure I. of the Categorical Syllogism, 123.
'Perfect Induction'—Note III.
Permutation—Same as Obversion.
Phenomenon — Anything (simple or complex) which appears or is apprehended.
Plurality of Causes—The doctrine of Plurality of Causes implies that different kinds of cause may produce the same kind of effect. This view can be accepted as plausible, only if *same effect* is taken in a looser sense than *same cause*; as *e.g.* when it is said that *different causes*—such as poison, violence, accident or disease—may produce the *same effect*, namely Death.
Plurative Proposition—A Proposition of which the Subject is quantified by a definite number, *e.g. Six A's are B, ½K is M.*
Polylemma (Tri-lemma, Tetra-lemma, etc.)—An Argument of the same form as a Di-lemma, but which has more than two Alternatives.
PONEND ALTERNATIVE ARGUMENTS, 154, 156.
Porphyry—Note II.
—— Tree of—Note II.
Positive Term—One which is not negative in form or meaning.
Postulate—'A position or a proposition of which the truth is demanded or assumed for the purpose of future reasoning; a supposition' (Worcester's *Dictionary of the English Language*). *E.g.* in geometry, 'if you will not allow me to describe a circle whenever I desire, then I cannot make one line the same length as another. . . . Thus the postulates are the conditions of . . . reasoning, but themselves form no part of the reasoning' (A. Milnes).
Predicables—Note II.
Predicamental Line—Note II.
Predicate, 9.
Premiss, 73, 115.
—— Major, 115.
—— Minor, 115.
Premisses, Defined, 86.
Principle of Categorical Assertion—Cf. *Law of Identity in Diversity*, 202, etc.
Principle of Interdependence, 135, 206, 207, 209.
Principles of Logic, 202-211.
Privative Conception, Inference by—Same as Obversion.
Proper Names, 6-7, 163-164, 166-167, 173-174.
PROPOSITION, Definition of, 1, 4.
—— Division of, 4.
—— Import of, 4, 20, etc.
—— Relative and Absolute, 14, etc.
—— CATEGORICAL, 4, 20-33.
—— —— Analysis of, 5, 8, 9, 20-25, 27-29, 36.
—— —— Symbolic representation of, 9.
—— —— Definition of, 20.
—— —— Import of, 20 *seq.*
—— —— Classification of, 30-33.
—— —— Division of—Cf. *Classification of.*
—— —— Whole, 30, 33.
—— —— Partial or Particular, 30, 33.
—— —— *ATTRIBUTE*, 30, 33.
—— *PROPER*, 30, 33.
—— *UNIQUE*, 30, 33.
—— *SPECIAL*, 30, 33.
—— *COMMON*, 30, 33.

PROPOSITION, Universal and General, 30, 31, 32.
—— Definite and Indefinite, 30, 31.
—— *RELATIVE* and *ABSOLUTE*, 30, 31.
—— Distributive and Collective, 30, 31.
—— Affirmative and Negative, 31, etc.
—— *ADJECTIVAL*, 14.
—— —— cannot be quantificated or converted, 15.
—— *COINCIDENTAL*, 14, 15.
—— Class, 25, 26.
—— *INFERENTIAL*, 4, 42-50, 51, 99-103, 112.
—— —— Definition of, 42.
—— —— Division of, 42, 51.
—— —— Forms of, 42.
—— CONDITIONAL (Cf. *Inferential*), 4, 42, 43-44, 49, 50.
—— —— Definition of, 43.
—— —— Division of, 47, 48, 51.
—— —— Analysis of, 47, 48.
—— *DIVISIONAL*, 47, 51.
—— *QUASI-DIVISIONAL*, 47-48, 51.
—— HYPOTHETICAL, 4, 42, 43, 44-47, 49, 51. *Cf.* also Inferential Proposition.
—— —— Definition of, 44.
—— —— Division of, 45, 51.
—— —— Analysis of, 45-47.
—— —— *FORMAL* or *SELF-CONTAINED*, 45, 51.
—— —— *REFERENTIAL*, 45-47, 51.
—— —— Whately's Definition of, 55.
—— *ALTERNATIVE* (or DISJUNCTIVE), 4, 52-56, 57, 103-105, 112-113.
—— —— Definition of, 55.
—— —— Forms of, 52, 53.
—— —— Division of, 53, 54, 57.
—— —— *CONDITIONAL*, 53, 57.
PROPOSITION, ALTERNATIVE, FORMAL or *SELF-CONTAINED*, 53, 54, 57.
—— —— *SUBSUMPTIONAL*, 53, 54, 57.
—— ——*CONTINGENT*, 54, 57.
——Disjunctive—Cf. *Alternative.*
—— Compound, 109.
—— Relations of, 72-77, 78, 157, 158, 159, etc. Cf. *Inferences, Incompatible Propositions, Inductions, Fallacies, Division*, etc.
—— *ATTACHED*, 72-74.
—— *UNATTACHED*, 74, 78.
—— Compatible, 72, 78.
—— Incompatible, 72, 78, 108-113.
—— —— Definition of, 72, 108.
—— *CORRELATIVE*, 72, 78.
—— Contrary and Contradictory—Cf. *Incompatible Propositions.*
—— Sub-contrary, 72, 78.
—— *PREMISSAL*—72, 78.
—— *ARGUMENTAL*, Relation between, 73, 78.
—— *CLASSIFIC*, Relation between, 73-74, 78, 109.
—— Mathematical, 14, 37-41.
—— O not convertible, 15, 65-66.
Proprium (Property)—Note II.
Pro-Syllogism—Note IV.
PURE ALTERNATIVE ARGUMENTS, 153, 156.
PURE INFERENTIAL ARGUMENTS, 150, 152.

QUALITY of Propositions—Their affirmativeness or negativeness.
Quantification, Meaning of, 58 note.
—— Function of, 69.
Quantification and Conversion, 58-66.
QUANTIFICATE—To quantify the Predicate-Name, 58.
Quantify—To add some adjective of quantity to the Subject-name or Predicate-name of a Proposition, 5, 58.
Quantitative Induction—Deter-

mination, by Induction, of the *quantity* of any factor involved. The Methods of Concomitant Variations and of Residues are sometimes called Methods of Quantitative Induction.
Quantity of Propositions—their Universality (Generality) or Particularity.
QUASI-CATEGORICAL — Denoting a combination of words akin to a Categorical Proposition —*e.g.* the Antecedent of a Conditional Alternative—53, etc.
Quaternio Terminorum—The fault of four Term-names in Premisses and Conclusion of a Categorical Syllogism.
Question-begging Epithets, 178.

RAMEAN TREE—Cf. *Tree of Porphyry.*
Ramus—Note II.
Ratiocination—Note V.
Realist Hypothesis of Universals —Note II.
Real Proposition—*Cf. Ampliative Proposition.*
Reduction—the process of changing a Categorical Syllogism from Fig. 2, 3, or 4, to Fig. 1; more generally, the process of changing an argument from one mood to another, 123 *seq.*
—— Direct (or Ostensive), 125-127, 129.
—— Indirect (*Reductio ad impossibile, Reductio ad absurdum, Reductio per impossibile*), 127-128.
Relation between Classes, 25.
—— —— Terms, 25.
—— —— Propositions, 72-78, etc.
Residues, Method of—*Cf.* Method of Residues.
Residual Phenomena—Phenomena that remain unaccounted for in an investigation.
RETROVERSION, 88, 97, 102, 105, 107.
REVERSE, REVERSION, 90, 107.

S—used for *Subject of a Categorical Proposition*, 9, 24, etc.
Sameness—(1) Identity, or (2) Similarity—(antithetic to *Difference*).
Secundi adjacentis, 'of the second adjacent'—Applied to a Categorical statement consisting of (1) Subject (2) Verb—*e.g.* Rembrandt paints.
Self-evidence, Principle of, 3, 211.
Self-evident — A Proposition is called *self-evident* if, when it is understood, 'it is very clearly and distinctly seen to be true,' and that without dependence upon any other Propositions.
Signification of Names and Terms, 5, 6, 20, 163-177 *passim.*
—— Statement of, 163.
—— Rules for determining, 169-170.
Similarity—There is similarity between *two* things when they *resemble* each other, produce impressions which we call *like*; and there is similarity between the different phases of *one* thing *in as far* as it remains unaltered. Similarity may be slight and partial, or so great as to amount to what has been called *indistinguishable resemblance* (*specie tantum*). Similarity (Resemblance) is antithetic to *Diversity* —205, etc.
—— and Dissimilarity, Maxims of, 138, 147, 207, 209.
—— in Otherness (or Distinctness), 20 *seq.*, 73, 74, 211.
Some, 66-69.
—— Definition of, 68.
Sophism — A specious but fallacious Argument, which may or may not be used with intent to deceive.

Sorites—Note IV.
—— Progressive—Note IV.
—— Regressive or Goclenian—Note IV.
Special Classification—Cf. *Classification, Artificial.*
Specialisation—The change in a term by which its application is narrowed or restricted—*e.g.* the word *Speaker* is specialised when used to indicate the chairman of the House of Commons. Cf. *Generalisation.*
Species (Predicable)—Note II.
——, *Infima*—Note II.
—— *Prædicabilis*—Note II.
—— *Subjicibilis*—Note II.
Statement, Definition of, 1.
Strengthened Syllogism—A Categorical Syllogism which has more terms distributed in the Premisses than is necessary in order to justify the conclusion. *Darapti, Felapton, Fesapo, Bramantip* are strengthened Syllogisms.
Sub-altern—Note I.
Subalternation, 67, 88, 93, 107.
Subaltern Genera and Species—Note II.
Subalternans, Subalternate — A and E is each a Subalternans to I and O respectively; I and O are Subalternates to A and E.
Sub-contrary—O and I Propositions are said to be Sub-contrary to each other—Note I.
Subject, 9.
SUBVERSION, 88, 93, 95, 96 note, 100-101, 104, 107.
Sufficient Reason, Law of—asserts that *Nothing can be or happen without an adequate reason of its being or happening.*
Sui generis—of its own kind, *i.e.* unique.
Sumption (1), Subsumption (2); Sir William Hamilton's names for the Major Premiss (1) and the Minor Premiss (2) of a Categorical Syllogism.
Suppositio Materialis—'There is a sense in which every word may become categorematic, namely, when it is used simply as a word, to the neglect of its proper meaning. Thus we can say "*Swiftly* is an adverb." *Swiftly* in this sense is really no more than the proper name for a particular word. This sense is technically known as the *Suppositis Materialis* of a word' (Stock, *Deductive Logic*, section 76).
Syllogism (Absolute Argument).
—— Categorical, 114-129.
—— —— Defined, 114.
—— —— Analysed, 115.
—— Hypothetical and Conditional, 49, 50, 150-152.
SYLLOGISMS, ALTERNATIVE—Cf. *Alternative Mediate Inferences.*
SYLLOGISMS, INFERENTIAL—Cf. *Inferential Mediate Inferences.*
Symbolic Logic—This phrase is ordinarily used to designate 'that branch of the science in which symbols of *operation* are used. Of course in one sense, all Formal [=General] Logic is symbolic' (Dr. Keynes).
Syncategorematic (pp. 85, 86)—A word is Syncategorematic if it cannot stand as the Subject or Predicate of a Categorical Proposition.
Synthesis—The operation of building up parts into a whole (cf. *Analysis*). The Method of Synthesis is said to be a Method of Instruction, because it is largely used in the teaching of subjects (such as Mathematics) in which the laws and principles have been already discovered,

and the pupil is instructed how to combine and apply them.
Synthetic Proposition—Cf. *Ampliative Proposition.*
System—By *System* is meant a group of two or more related objects.
Systematisation, 159, 162.

TAUTOLOGY, 119, etc.
Tautologous Proposition—A Proposition of the forms (1) *A is A*, (2) *If A, then A*, or (3) *A or A*.
TERMS, 5-17, 19.
—— Distinguished from *Name*, 5.
—— Definition of, 9.
—— Distinguished from Termname, 10.
—— Division of, 13, 15, 16.
—— Dependence of, on Context, 12, 13, 172 *seq.*
—— Table of, 19.
—— *UNI-TERMINAL*, 13, 14, 15.
—— *BI-TERMINAL*, 13, 14, 15.
—— Universal and General, 12.
—— Whole, 15, 16.
—— Partial, 15, 16.
—— *UNIQUE*, 15.
—— *PROPER*, 15.
—— Common, 15.
—— *SPECIAL*, 15.
—— Relative, 13, 14. 15.
—— Absolute, 13, 14, 16.
—— Definite, 16.
—— Indefinite, 16.
—— *ATTRIBUTE*, 15.
—— *SUBSTANTIVE*, 15.
—— Technical, 16.
—— Application of, 36, Section iii. *passim.*
—— Signification of, 36, Section iii. *passim.*
TERM-CONSTITUENT — A Term-Name or Term-Indicator.
TERM-INDICATOR, 10, 64, 178.
TERM-NAME, 10, 115, 178.
—— and Term, distinguished, 10.
Terminology—has been distinguished from Nomenclature, as including all the terms necessary to describe the objects referred to by the names which come under the head of Nomenclature—*e.g.* petal, calyx, corolla, are part of the terminology of Botany. It is sometimes difficult to distinguish between Nomenclature and Terminology —*e.g.* to say under which head *Terms* and *Propositions* ought to be classed, in Logic.
Tertii Adjacentis, 'of the third adjacent'—applied to a Categorical Statement consisting of (1) Subject, (2) Copula, (3) Predicate—*e.g.* Rembrandt is painting.
Things, Two-fold aspect of, 5, 6, 20.
TOLLEND ALTERNATIVE ARGUMENTS, 154, 156.
Totum Divisum—The whole which is separated intoparts—*Membra Dividentia*—by division.
Traduction—This term is applied by Jevons to Categorical Arguments in which all the Subjects have identical application—*e.g.* Snowdon is the highest hill in Wales ; Snowdon is not so high as Ben Nevis ; ∴ the highest hill in Wales is not so high as Ben Nevis.
TRANSFORMATIONS, 98-99, 103, 105, 107.
TRANSVERSIONS, 88, 105-106, 107.

UNDISTRIBUTED TERM—Cf. *Distributed Term.*
Uniformity, 135 *seq.*
Uniformity of Interdependence, 204, 205, 205 note.
Uniformity of Succession—dependent upon uniformity of Coexistence, 137.—The principle of Uniformity of Succession (or

Causation) is formulated as follows by the late Professor Clerk Maxwell, under the name of 'The General Maxim of Physical Science':—'The difference between one event and another does not depend on the mere difference of the times or the places at which they occur, but only on differences in the nature, configuration, or motion of the bodies concerned.' (Cf. *Cause and Effect.*)
Unity in Difference—73, 75, etc.
——, the three kinds of, 75, 211.
Univocal Name—A Name which has only one application—contrasted with *Equivocal Name*, 172.
VERBAL PROPOSITION—Cf. *Essential Proposition.*
Verification—Proof by appeal to experience, Note v.
WEAKENED Syllogism—A Categorical Syllogism in which the Conclusion is Particular when the Premisses would justify its being Universal. A Weakened Syllogism has a Weakened Conclusion, and is said to be in a Subaltern Mood.
Whole and Parts, 74, 75.

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